Dissertation on

COMPARISON OF LATERAL APPROACH VERSUS SUBCLAVIAN PERIVASCULAR APPROACH OF SUPRACLAVICULAR BLOCK. A STUDY OF 60 CASES

Submitted to

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfilment of the requirements

For the award of degree of

MD (BRANCH - X)

ANAESTHESIOLOGY

GOVERNMENT STANLEY MEDICAL COLLEGE & HOSPITAL

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

CHENNAI, TAMILNADU

APRIL - 2013

CERTIFICATE

This is to certify that the dissertation entitled **"COMPARISON OF LATERAL APPROACH AND SUBCLAVIAN PERIVASCULAR APPROACH OF SUPRACLAVICULAR BLOCK"**is a genuine work done by **Dr. M.S.PRABHU** for the partial fulfilment of the requirements for M.D. (Anaesthesiology) Examination of The Tamilnadu Dr. M.G.R. Medical University to be held in April 2013, under my supervision and the guidance of **Dr.KUMUDHA LINGARAJ M.D., D.A**, Professor, Department of Anaesthesiology at Stanley Medical College, Chennai.

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This is to certify that the dissertation presented **"COMPARISON OF LATERAL APPROACH AND SUBCLAVIAN PERIVASCULAR APPROACH OF SUPRACLAVICULAR BLOCK"**herein by **Dr. M.S.PRABHU** is an original work done in the Department of Anaesthesiology, Government Stanley Medical College and Hospital, Chennai in partial fulfilment of regulations of the Tamilnadu Dr. M.G.R. Medical University for the award of degree of M.D. (Anaesthesiology) Branch X, under my supervision during the academic period 2010-2013.

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DECLARATION

I, **Dr. M.S.PRABHU,** Solemnly declare that the dissertation, titled **"COMPARISON OF LATERAL APPROACH AND SUBCLAVIAN PERIVASCULAR APPROACH OF SUPRACLAVICULAR BLOCK"** is a bonafide work done by me during the period of April 2012 to September 2012 at Government Stanley Medical College and Hospital, Chennai under the expert supervision of **Dr.P.CHANDRASEKAR, M.D, D.A.**Professor and Head, Department Of Anaesthesiology, Government Stanley Medical College, Chennai. This thesis is submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfilment of the rules and regulations for the M.D. degree examinations in Anaesthesiology to be held in April 2013.

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CONTENTS

INTRODUCTION

Regional anaesthesia enables site specific, long lasting and effective anaesthesia and analgesia.

Brachial plexus block is a valuable addition to a general anaesthetic for surgery of the upper limb or a suitable alternative to general anaesthesia in certain patients.Brachial plexus blocks are among the most commonly performed, and most commonly studied peripheral blocks owing to their success rate and their ability to provide prolonged postoperative analgesia. In addition, the sympathetic block produced is of value for arm or hand reimplantation surgery or to establish a vascular shunt for dialysis.

It has a major impact on patient outcome such as patient satisfaction and early mobilization.

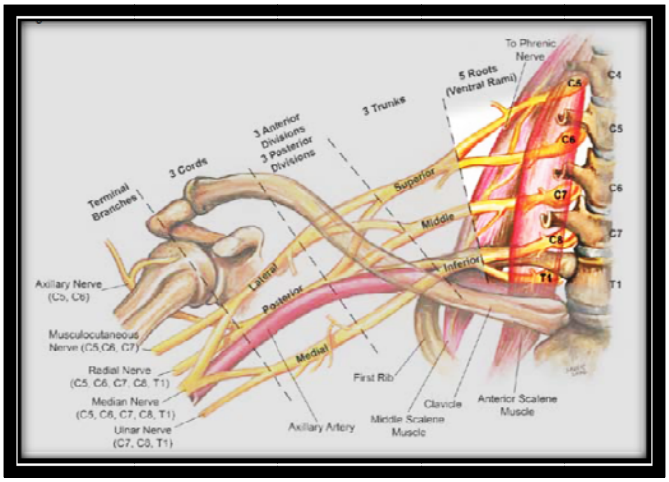
Although many approaches to the brachial plexus have been described, there are traditionally four anatomic locations where local anaesthetics are deposited.

1) The interscalene groove near the cervical transverse process

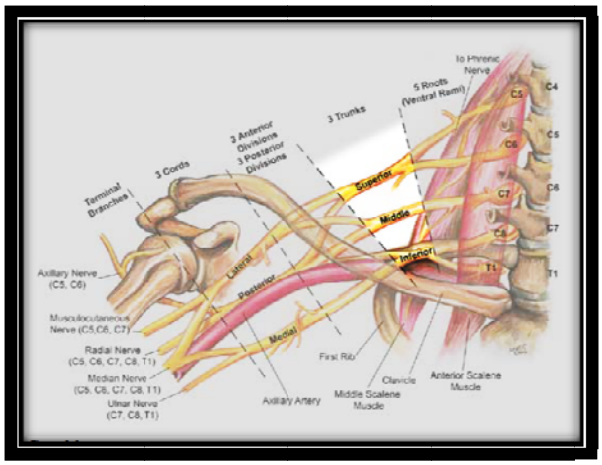
2) The subclavian sheath at the first rib

3) Near the coracoid process in the infraclavicular fossa

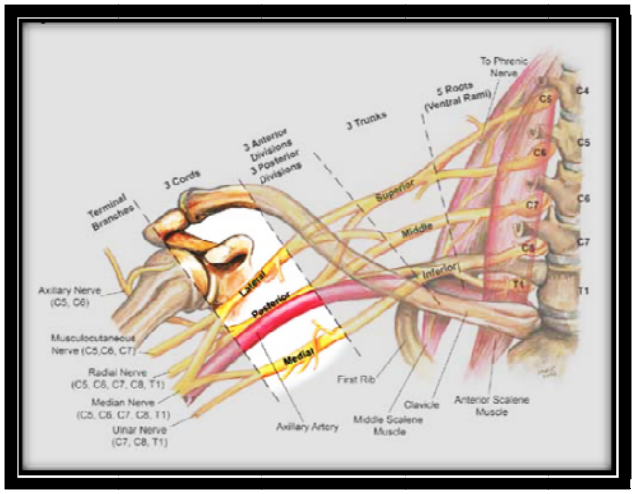
4) Surrounding the axillary artery in the axilla.



Interscalene block is often useful for shoulder and upper arm surgery, but it has various complications like accidental vertebral artery injury, phrenic nerve and recurrent laryngeal nerve paralysis, rarely central neuraxial blockade and in this blockade ulnar nerve is frequently spared.

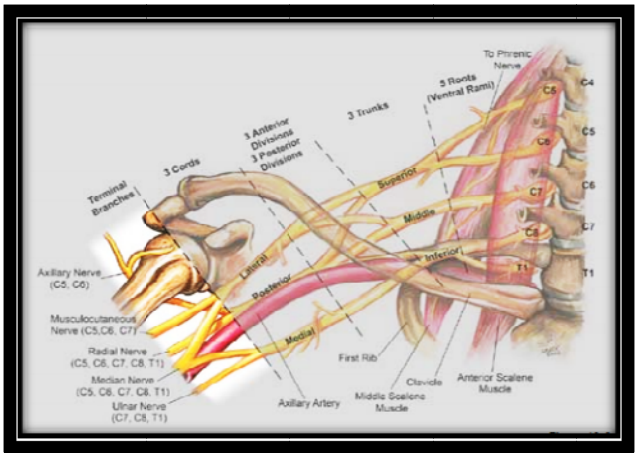


Supraclavicular block has various advantages like high success rate, dense blockade and devoid of interscalene block complications. But accidental vessel injury and pneumothorax can occur in this technique.



Infraclavicular block has decreased incidence of pneumothorax, arterial injury and it is an ideal site for continuous catheter placement. But it is the most painful approach when compared to other approaches because the plexus is deeply placed in this location, hence both the

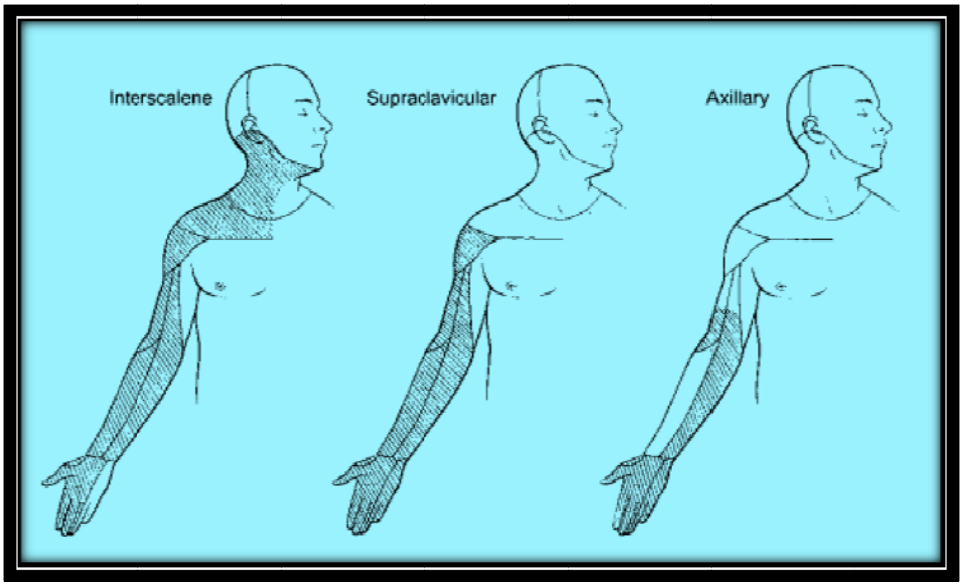
pectoralis major and pectoralis minor muscles will have to be pierced to reach the plexus.



Axillary block can be easily performed and individual nerves can be blocked in this site but sparing of musculocutaneous nerve and intercosto brachial nerve is common in this approach.

SENSORY BLOCK PATTERNS

Typical sensory block pattern in various approaches illustrated below :



Because of the normal anatomical variation in brachial plexus arrangement at each level, the distribution of blockade is also varies for each level of brachial plexus block.

For example, In Interscalene block, the ulnar nerve distribution area is frequently spared. In Supraclavicular block, the intercostobrachialnerve is spared which is responsible for tourniquet pain in upper limb surgeries. In axillary block, the musculocutaneous nerve sparing is commonly observed.

Until recently, paraesthesia technique has been described to locate nerves for peripheral nerve blocks. Peripheral nerve stimulator technology utilizes objective end points for nerve localization and does not depend on patient's subjective feeling for effective nerve localization. An effective use of **P**eripheral **N**erve **S**timulators (**PNS**) technology mandates the knowledge of anatomy with respect to optimal needle insertion site to achieve needle tip-target neuromuscular junctions.And also to differentiate desired **E**voked **M**otor **R**esponse (**EMR**) from the alternate EMRs elicited by the stimulation of adjacent muscles and collateral nerves.

Therefore an algorithm can be designed for needle redirection during PNS assisted Peripheral nerve block.

Recent development in imaging modalities for brachial plexus block like fluoroscopy and ultrasound are useful in performing block precisely without much complications and local anaesthetic drugs requirement is also low when performing blocks using these modalities.

SUPRACLAVICULAR BLOCK

Supraclavicular block targets the trunks and/ or divisions of the brachial plexus depending upon the injection site and the patient's anatomy. At this point brachial plexus is compact and a small volume of local anaesthetic solution produces rapid onset of reliable blockade of the brachial plexus.

It is called as spinal anaesthesia of upper extremity[1].

Various approaches have been described for supraclavicular brachial plexus block. Recent one was demonstrated by Dilip Kothari in 2003, using lateral approach paraesthesia technique which was later modified by DK Sahu in 2010, using peripheral nerve stimulator.

Both of them concluded in their study that lateral approach had a higher success rate and less complication rate when compared to the other approaches of supraclavicular block.

Hence we wanted to compare the lateral approach with the subclavian perivascular approach which is commonly practiced in our institute in terms of success rate and complications.

AIM OF THE STUDY

Aim of the study is to compare lateral approach and subclavian perivascular approach of supraclavicular brachial plexus block using peripheral nerve stimulator in view of number of attempts, procedure time, success rate and complications in patients undergoing surgery below midarm.

HISTORY

In 1884, **HALSTED** first performed the brachial plexus block by injecting cocaine solution in roots of brachial plexus and then he explored the cords and nerves[3].

In 1911 **HIRSCHEL and KULENKAMPFF**, working independently, were the first to inject the brachial plexus percutaneously, (blindly through the skin),without exposure of the nerves. This was the first method of supraclavicular block[4].Later it was modified by **WINNE and COLLINS**. They demonstrated brachial plexus block by subclavian perivascular approach.[5]

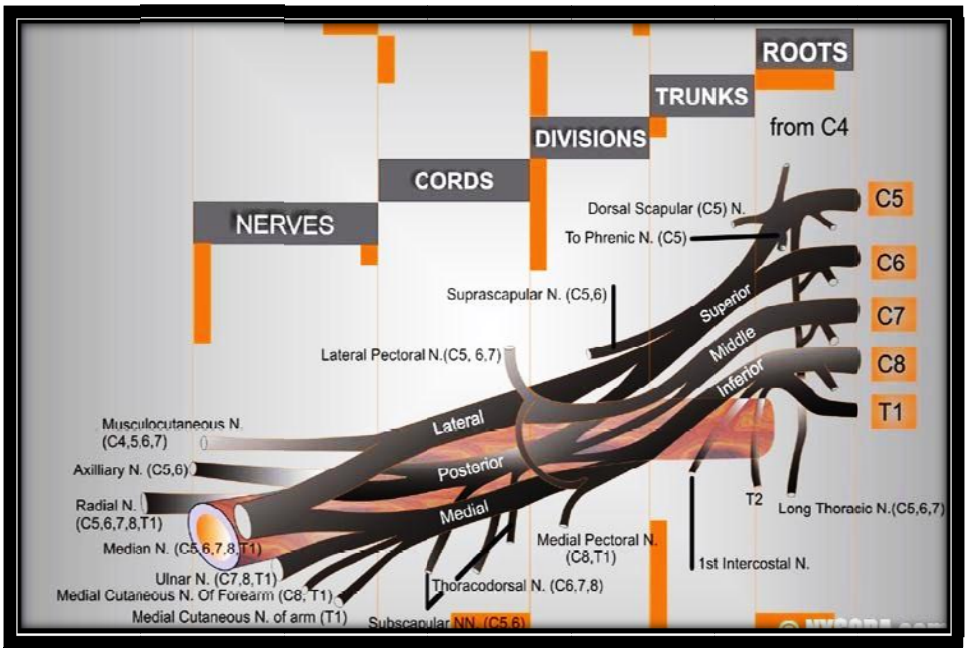
In 1993, **BROWN** demonstrated the plumb pop technique of brachial plexus block[6].

In 1981 **HEMPEL** performed lateral approach supraclavicular block using plastic cannula for continuous analgesia[8]. This was modified by **DILIP KOTHARI** in 2003 and he had described lateral approach of supraclavicular block using paraesthesia technique[9].

In 2010 **DK SAHU** had described the lateral approach of supraclavicular block using peripheral nerve stimulator[10] .

ANATOMICAL CONSIDERATIONS[11-20]

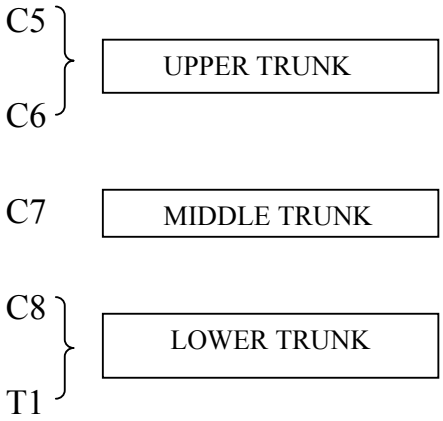
The brachial plexus anatomy is essential for the intelligent and effective use of the brachial plexus blockade for surgeries of the upper limb. Close familiarity with the vascular, muscular and fascial relationship of the plexus throughout the formation and distribution is equally essential to the mastery of various techniques of Brachial plexus blockade.



The brachial plexus classically arises from the anterior primary rami of C5 – 8 and T 1 spinal nerves.

Course:

The C5-T1 nerve roots emerge from their corresponding intervertebral foramina and then travel along the grooves between the anterior and posterior tubercles of the corresponding transverse process. They finally emerge between scalenus anterior and medius muscles, above the second part of the subclavian artery and posterior to vertebral artery. Here they join together to form the trunks.



The prevertebral fascia invests both the anterior and middle scalene muscles, fusing laterally to enclose the brachial plexus in a fascial sheath.

The three trunks travel inferolaterally and cross the base of the posterior triangle of the neck and the first rib (upper and middle trunks above the subclavian artery and lower trunk behind the artery). At the

lateral border of first rib each trunk bifurcates into anterior and posterior divisions.

Approximately at the level where the nerves course under the pectoralis minor muscle, the divisions converge to form three cords :

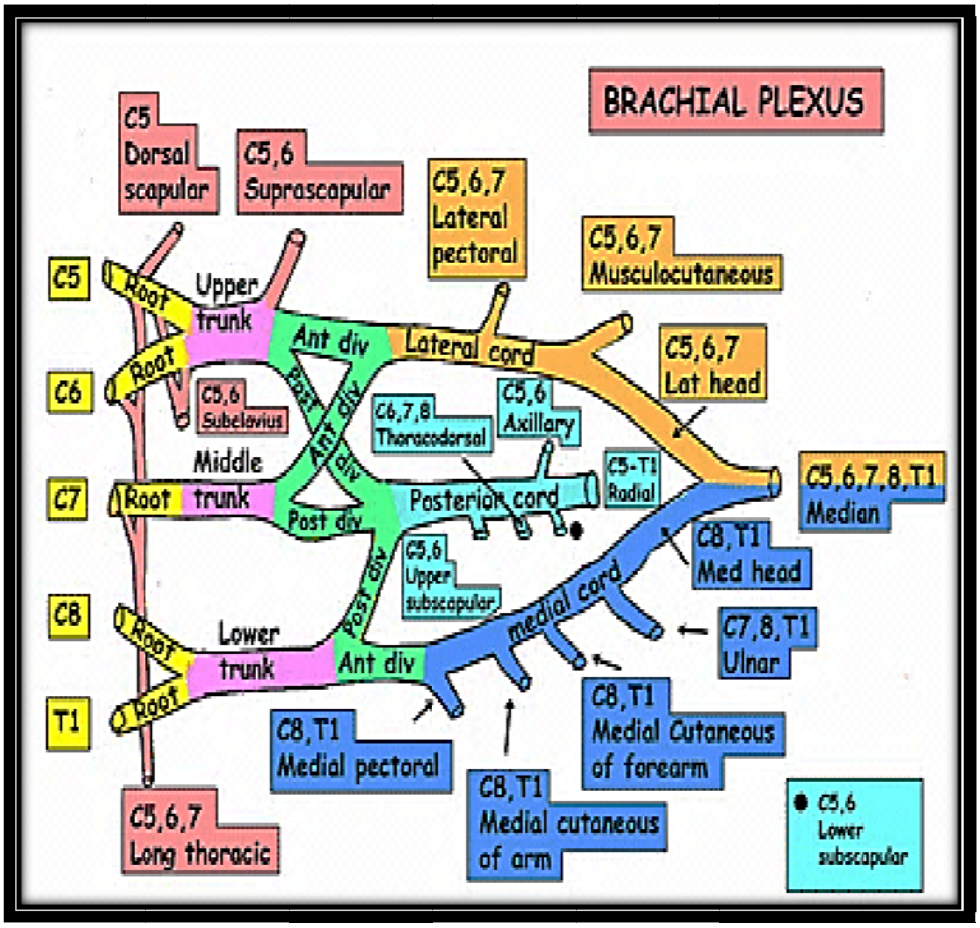
Lateral cord -anterior division of upper and middle trunk

Medial cord -anterior division of lower trunk

Posterior cord - posterior division of all three trunks.

The cords are grouped around the second part of the axillary artery.

Immediately beyond the pectoralis minor muscle, the three cords diverge into the terminal branches; these include the median, ulnar, radial, axillary and musculocutaneous nerves.


BRACHIAL PLEXUS
C5
Dorsal scapular
C5,6
Suprascapular
C5,6,7
Lateral pectoral
C5,6,7
Musculocutaneous
C5
C6
C7
C8
T1
Root
Upper trunk
Middle trunk
Lower trunk
Ant div
Post div
Lateral cord
Posterior cord
medial cord
C5,6,7
Lat head
C5,6
Subclavius
C6,7,8
Thoracodorsal
C5,6
Axillary
C5-T1
Radial
C5,6,7,8,T1
Median
C8,T1
Med head
C5,6
Upper subscapular
C7,8,T1
Ulnar
C8,T1
Medial Cutaneous of forearm
C8,T1
Medial pectoral
C8,T1
Medial cutaneous of arm
C5,6,7
Long thoracic
C5,6
Lower subscapular

Lateral cord

Lateral root of median nerve

Lateral pectoral nerve

Musculocutaneous nerve

Medial cord

Medial root of median nerve

Medial cutaneous nerve of arm

Medial cutaneous nerve of forearm

Medial pectoral nerve

Ulnar nerve

Posterior cord

Radial nerve

Axillary nerve

Upper and lower subscapular nerve

Nerve to lattismusdorsi

Branches from roots

Dorsal scapular nerve to Rhomboid muscles (C5)

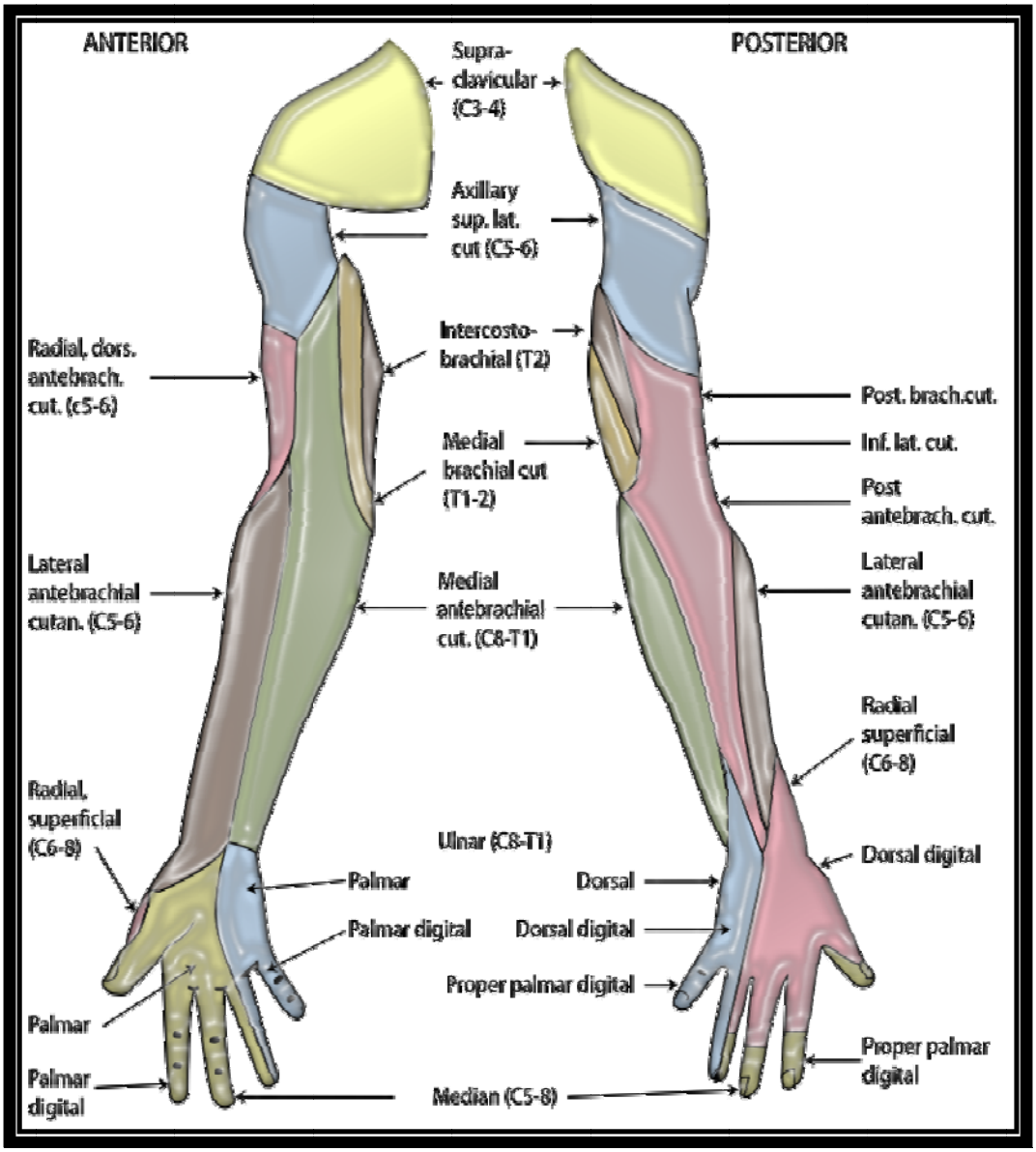
Nerve to serratus anterior (C5, C6, and C7)

Branches from trunk

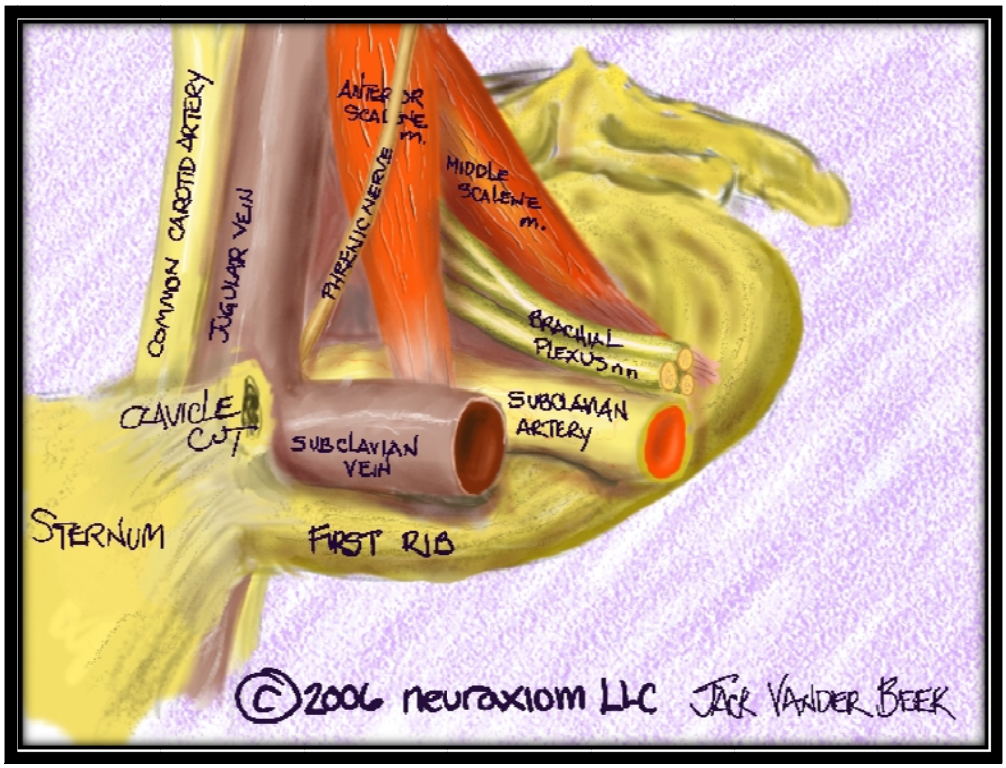
Nerve to subclavius (C5-C6)

Suprascapular nerve (C5-C6)

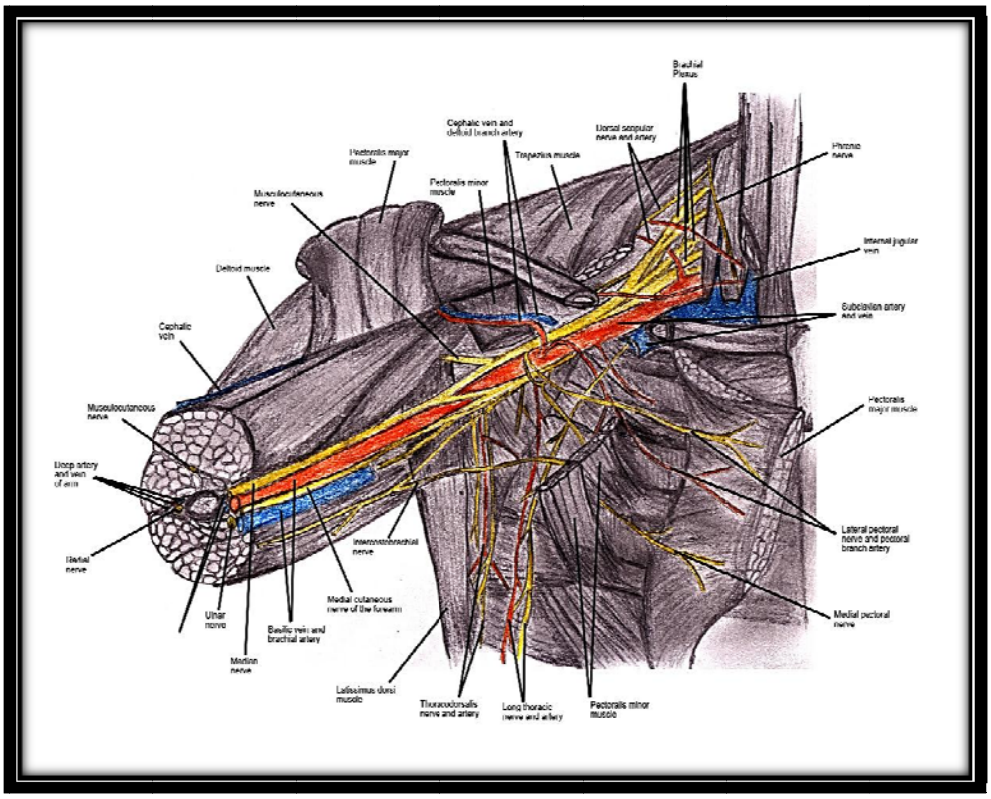
SENSORY INNERVATIONS OR UPPER LIMB



SUPRACLAVICULAR ANATOMY



Brachial plexus roots are located between anterior scalene and scalenusmedius muscles and the trunks are located in the base of posterior triangle neck and the divisions are located at the lateral border of first rib below the clavicle and cords at the level of the Axilla and nerves beyond the axilla. In its course it lies superior and posterior to the subclavian artery. Dome of pleura is anteromedial to the lower trunk and posteromedial to the subclavian artery.



VASCULAR RELATIONSHIP AT VARIOUS LEVELS

Vertebral artery - Cervical roots emerges from the transverse process of vertebra and lies posterior to the vertebral artery.

External jugular vein - At C6 level, external jugular vein travels over the interscalene groove in most of the cases.

Subclavian artery - At the level of 1st rib, divisions of brachial plexus lieslateral, posterior and cephalad to the artery.

FUNCTIONAL ANATOMY AND TECHNIQUES

1. Subclavian perivascular approach of supraclavicular block

2.Lateral approach of supraclavicular block

1. SUBCLAVIANPERIVASCULAR APPROACH OF SUPRACLAVICULAR BLOCK[20]

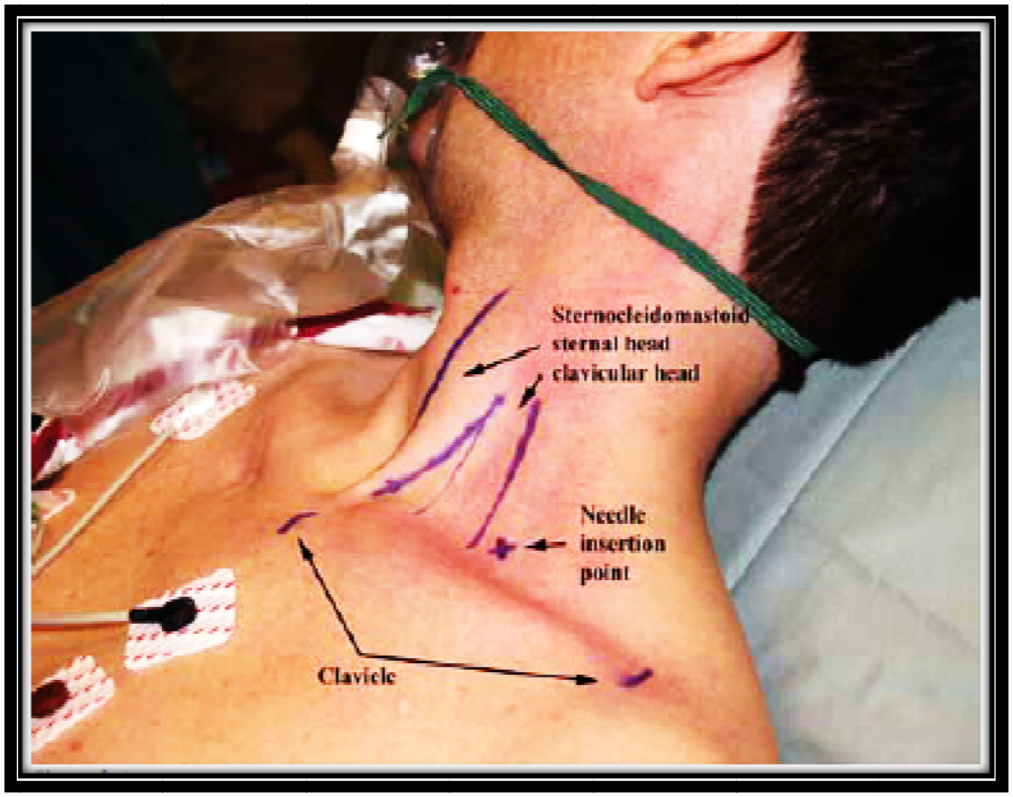
Patient position

The patient is positioned supine with the head faced slightly to the contralateral side.A small towel is placed behind the shoulder to make the supraclavicular area prominent. The arm rests besides the body.

The outline of clavicle is drawn on the skin and the midpoint of the clavicle is marked. Needle insertion point is marked just above this midpoint which is just lateral to the sternocleidomastoid insertion.

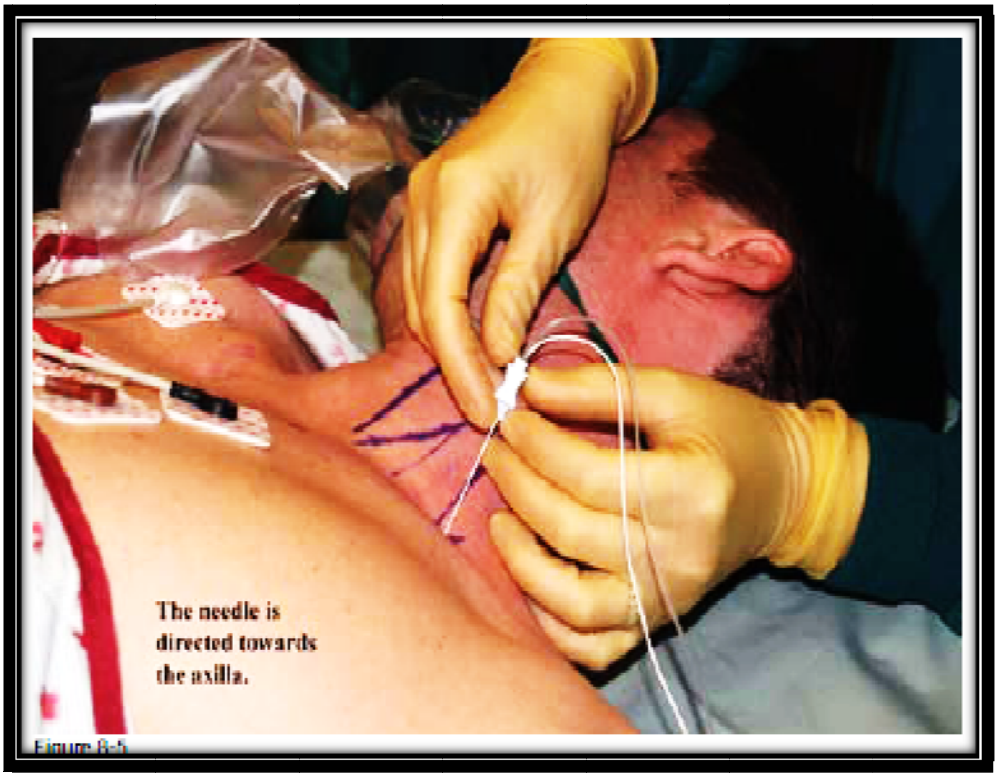
The subclavian artery pulse serves as a reliable landmark as the plexus lies immediately cephaloposterior to the artery.

NEEDLE ENTRY



This Figure showing the needle entry point which is just above the midpoint of clavicle and just lateral to the sternocleidomastoid clavicluar head insertion.

NEEDLE DIRECTION



This Figure showing the needle direction which is towards the axilla or ipsilateral great toe.

Procedure [21-25]

The operator stands at head end of the patient on the ipsilateral side. Under strict aseptic precautions skin infiltration done with 1% lignocaine at the entry point. The insulated 22G, 5cm block needle is inserted at 45 degree caudally towards theipsilateral toe.The needle is advanced till a pop off is felt which signifies the entry into the perivascular sheath. Now the nerve locator is switched on and the stimulating current set at 2.0mA, 2Hz. The needle is advanced until finger flexion or extension is seen.Then current is decreased to 0.5 mA. After negative aspiration for blood, the local anaesthetic mixture is injected slowly.

2.LATERAL APPROACH OF SUPRACLAVICULAR BLOCK[10]

Patient position

The patient is positioned supine with the head faced slightly to the contralateral side. A small towel is placed behind the shoulder to make the supraclavicular area prominent. The arm rests besides the body.

NEEDLE ENTRY

At the junction of inner two third and outer onethird andone cm above the clavicle insertion point is marked.

Procedure

The operator stands at the head end of patient.Under strict aseptic precautions, skin is infiltrated with 1% lignocaine at the needle insertion point. The insulated 22G, 5cm block needle is inserted at an angle of 20 degree to the skin, parallel to clavicle deep to the external jugular vein. Stimulating current is set at 2.0mA, 2Hz. Once the finger twitch either flexion or extension is obtained the current is decreased to 0.5 mA.After negative aspiration for blood, the local anaesthetic mixture is injected slowly.

FINGER TWITCH ELICITATION

PHYSIOLOGICAL BASIS OF PERIPHERAL NERVE STIMULATON[22-26]

The nerve stimulator's efficacy depends upon the intensity, duration, and polarity of the stimulating current used and the needle (stimulus)-nerve distance. Peripheral nerve stimulation is typically performed using a rectangular pulse of current. When a square pulse of the current is used to stimulate a nerve, the total charge delivered is the product of the current strength and the duration of pulse.

RHEOBASE-is the minimal threshold current required to stimulate a nerve with a long pulse width.

CHRONAXIE- is the duration of the stimulus required to stimulate at twice the rheobase. A-α (motor) fibrescan be stimulated without stimulating A-δ and C fibres that transmit pain. Moreover mixed nerves can be located by evoking a motor response without causing patient discomfort. The intensity of Stimulation isdetermined by **coulomb's law**.

COULOMB's LAW :

$$\mathbf{E = K (Q / r^2)}$$

E - Stimulus intensity

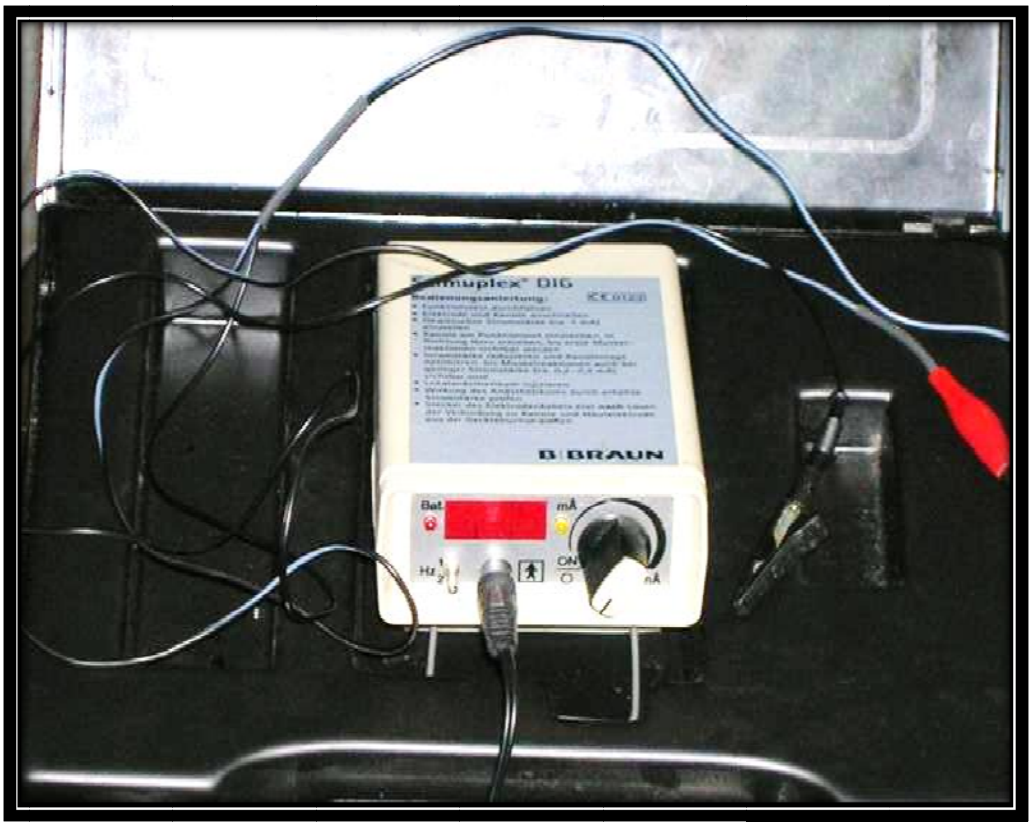
K - Constant

Q - Minimum current from needle tip

r - Distance of needle from nerve

Here, $Q \alpha r^2$. Hence nerve can be stimulated at lower currentonly if it lies close to the needle tip

An EMR at a stimulating current of <0.5mA is associated with high rates of success of PNS assisted PNB.


muplex® DIG
B|BRAUN
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Characteristics of an ideal PNS: [27-30]

1. Constant current output
2. Digital display of the delivered current
3. Variable output control
4. Clearly identifiable polarity
5. Option for different pulses
6. A wide range of current output 0.1-5.0mA
7. Battery indicator

Peripheral nerve stimulator settings:

MIXED NERVE(most PNB)

Current(dial) -> 1mA

Current duration -0.1ms

Frequency -> 1-2Hz

SENSORY NERVE(eg-Lateral femoral cutaneous and saphenous nerves)

Current (dial) ->2-5mA

Current duration -1ms

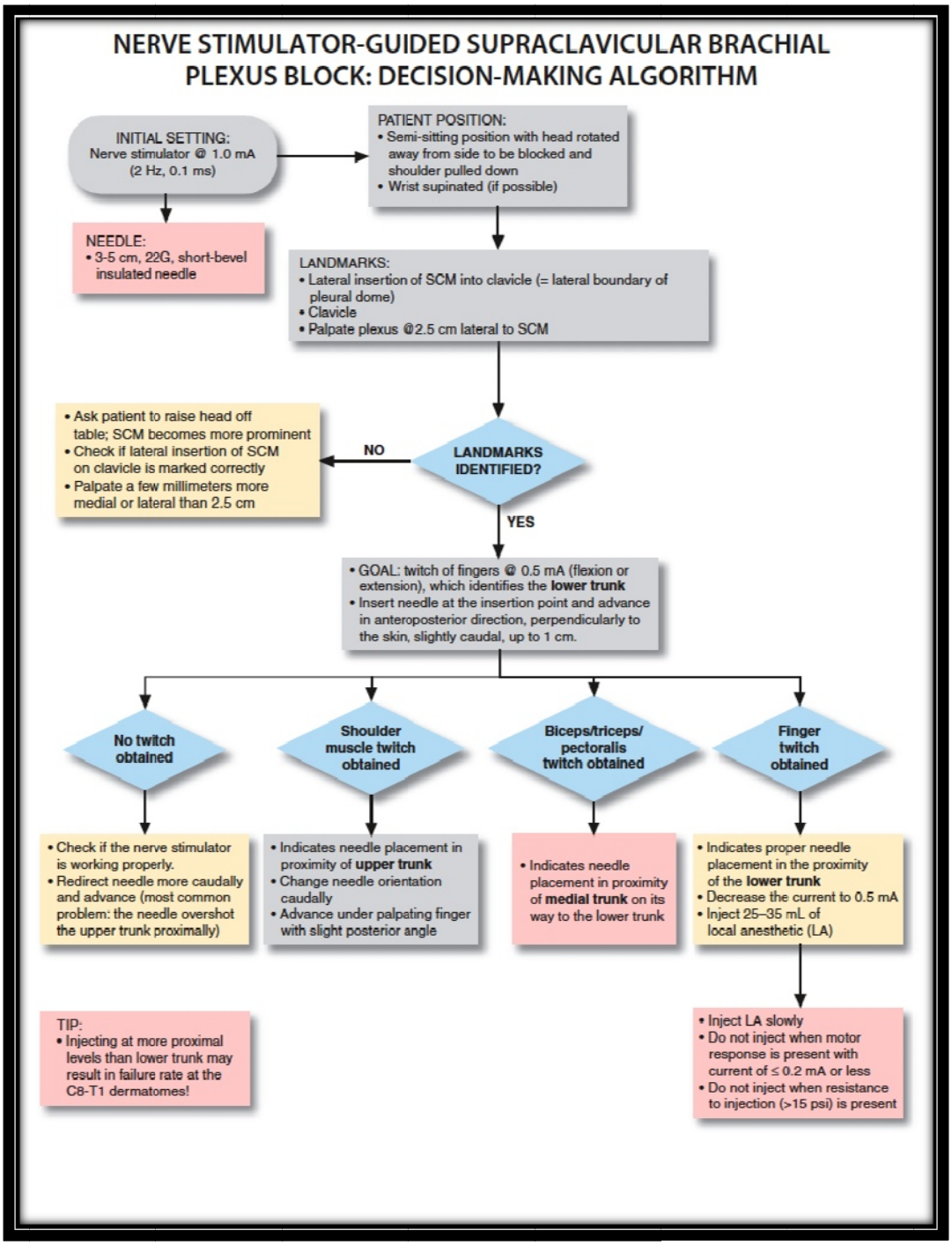
Frequency -1Hz

DIABETIC NEUROPATHY(PNB)

Current(dial) ->2mA

Current duration ->0.3ms

Frequency ->1-2HZ


NERVE STIMULATOR-GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK: DECISION-MAKING ALGORITHM
INITIAL SETTING:
Nerve stimulator @ 1.0 mA
(2 Hz, 0.1 ms)
PATIENT POSITION:
• Semi-sitting position with head rotated away from side to be blocked and shoulder pulled down
• Wrist supinated (if possible)
NEEDLE:
• 3-5 cm, 22G, short-bevel insulated needle
LANDMARKS:
• Lateral insertion of SCM into clavicle (= lateral boundary of pleural dome)
• Clavicle
• Palpate plexus @2.5 cm lateral to SCM
LANDMARKS IDENTIFIED?
NO
• Ask patient to raise head off table; SCM becomes more prominent
• Check if lateral insertion of SCM on clavicle is marked correctly
• Palpate a few millimeters more medial or lateral than 2.5 cm
YES
• GOAL: twitch of fingers @ 0.5 mA (flexion or extension), which identifies the lower trunk
• Insert needle at the insertion point and advance in anteroposterior direction, perpendicularly to the skin, slightly caudal, up to 1 cm.
No twitch obtained
Shoulder muscle twitch obtained
Biceps/triceps/ pectoralis twitch obtained
Finger twitch obtained
• Check if the nerve stimulator is working properly.
• Redirect needle more caudally and advance (most common problem: the needle overshot the upper trunk proximally)
• Indicates needle placement in proximity of upper trunk
• Change needle orientation caudally
• Advance under palpating finger with slight posterior angle
• Indicates needle placement in proximity of medial trunk on its way to the lower trunk
• Indicates proper needle placement in the proximity of the lower trunk
• Decrease the current to 0.5 mA
• Inject 25–35 mL of local anesthetic (LA)
TIP:
• Injecting at more proximal levels than lower trunk may result in failure rate at the C8-T1 dermatomes!
• Inject LA slowly
• Do not inject when motor response is present with current of ≤ 0.2 mA or less
• Do not inject when resistance to injection (>15 psi) is present

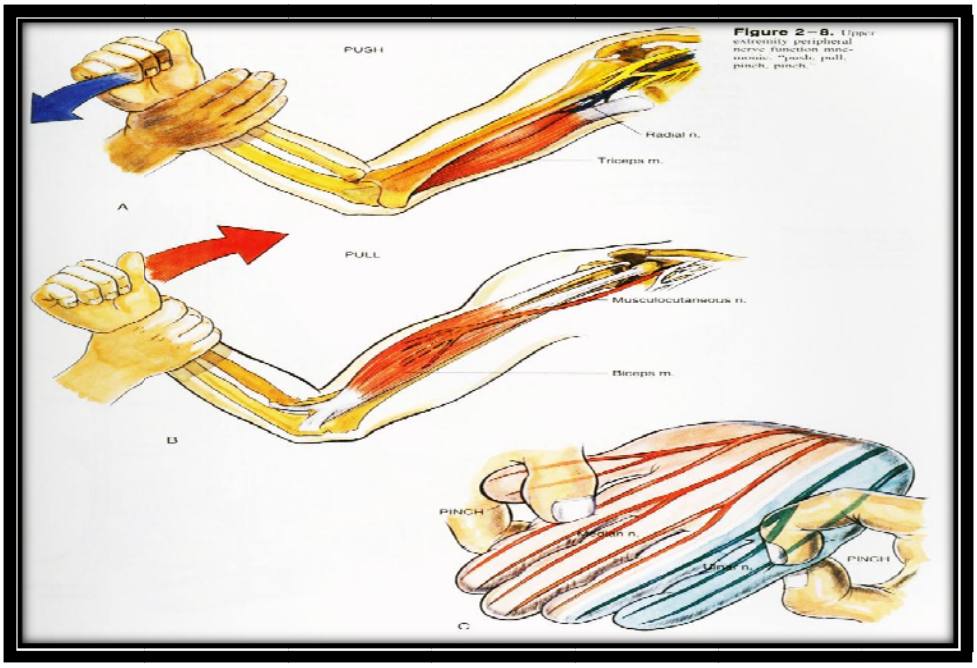
ASSESSING THE SUCCESS OF BLOCKADE

“Push, Pull, Pinch Pinch”

Push - To check the radial nerve (triceps is the main muscle forextension at elbow which is supplied by radial nerve. Patientis asked to extend the elbow against resistance)

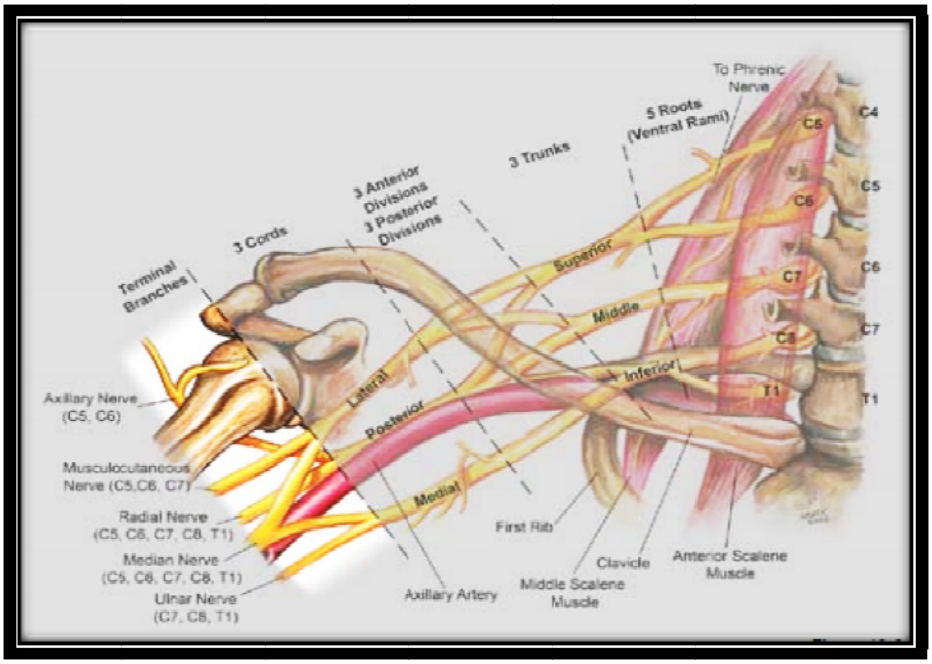
Pull - To check musculocutaneous nerve (biceps is the main flexorat elbow which is supplied by musculocutaneous nerve. Patient is asked to flex the elbow against resistance)

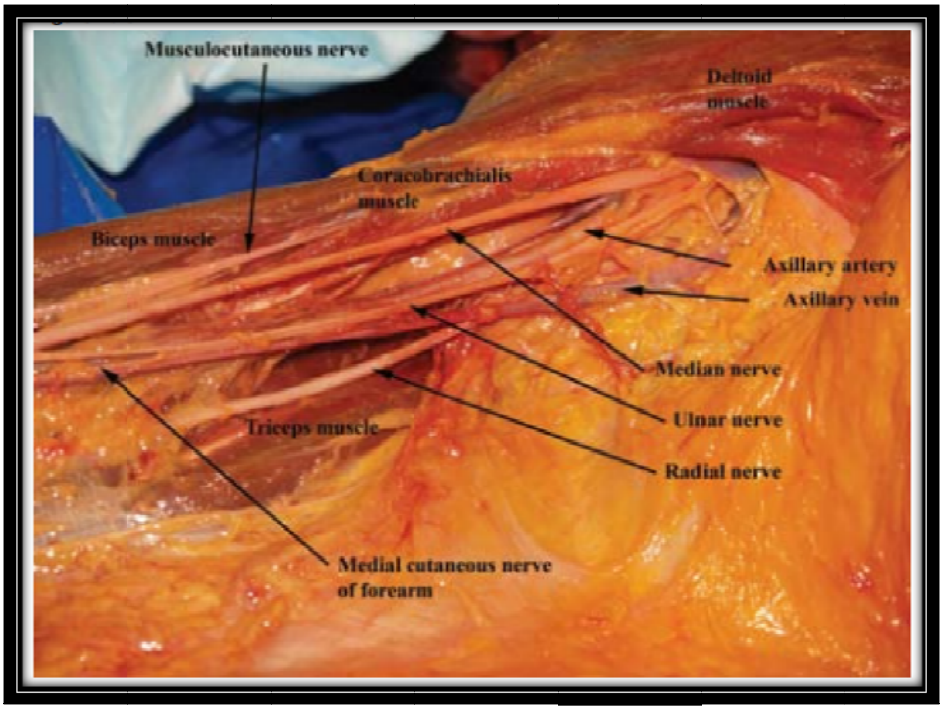
Pinch, Pinch - To check the sensory distribution of median and ulnar nerve.



RESCUE BLOCKS

1) AT AXILLA LEVEL:





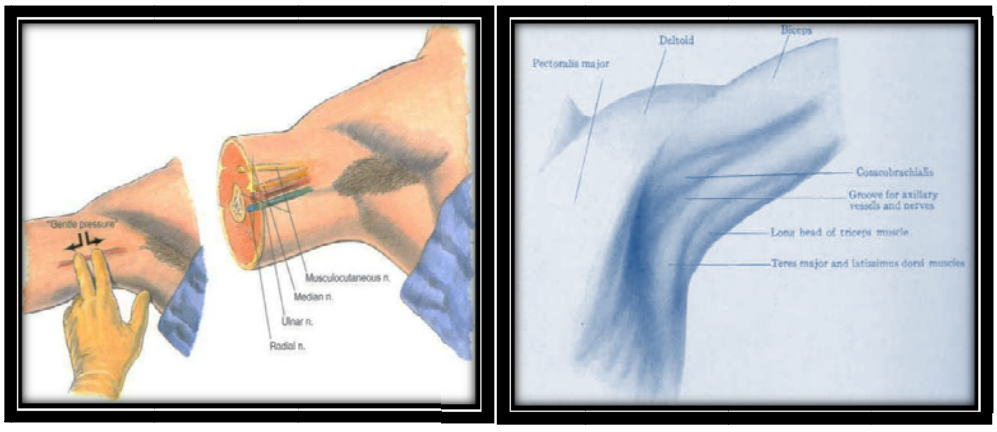
Each nerve can be individually blocked in axillary area

Median nerve - Needle is inserted just above the axillary arteryperpendicular to the skin.

Ulnar nerve - Axillary artery is retracted upwards and needle isinserted below the artery and 45°angle to the skin.

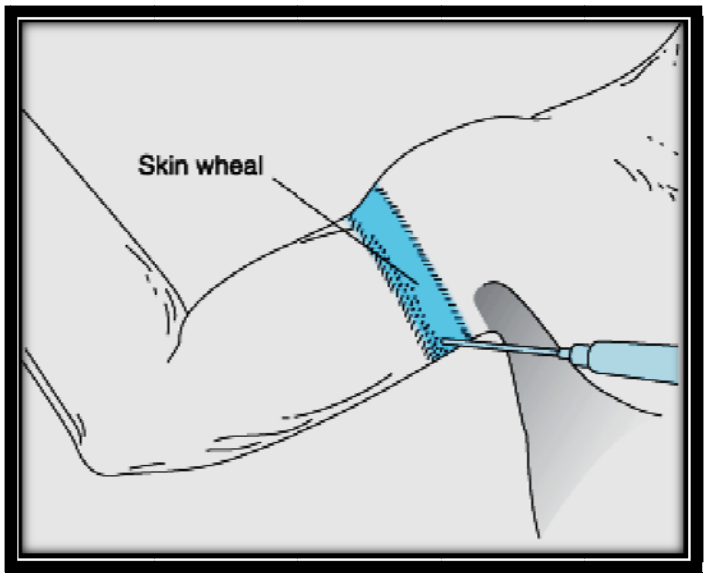
Radial nerve - Axillary artery is retracted upwards and needle isinserted below the artery and 60°angle to the skin.

Musculocutaeous nerve - At upper half of the humerus the needle inserted into the coracobrachialis muscle.



Intercostobrachial nerve block:

Intercostobrachial nerve arises from the ventral rami of second thoracic vertebra, then joins with the medial cutaneous nerve and supplies the skin over upper half of posterior and medial side of the arm.



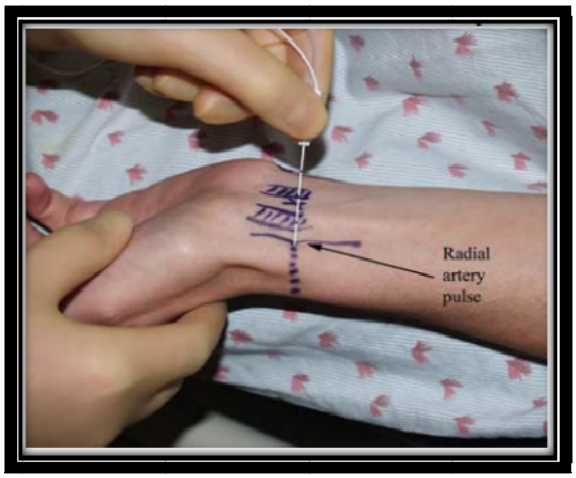
This nerve is to be blocked in shoulder surgery and for tourniquet pain.Block is done by local infiltration or paravertebral block at T1-2 level.

2) AT ELBOW LEVEL :

	NERVE	INJECTION LANDMARKS	MOTOR RESPONSE IN PNS
1	RADIAL	LATERAL TO BICEPS TENDON & 2 cm PROXIMAL TO ELBOW CREASE	WRIST & THUMB EXTENSION
2	MEDIAN	AT THE ELBOW CREASE 1 cm MEDIAL TO BRACHIAL ARTERY	FLEXION OF FINGERS, PRONATION OF WRIST
3	ULNAR	2 cm PROXIMAL TO ULNAR SULCUS	ADDUCTION OF THUMB, FLEXION OF RING FINGER
4	MUSCULOCUTANEOUS	AT LATERAL BOREDR OF BICEPS TENDON SUBCUTANEOUS INFILTRATION	----------

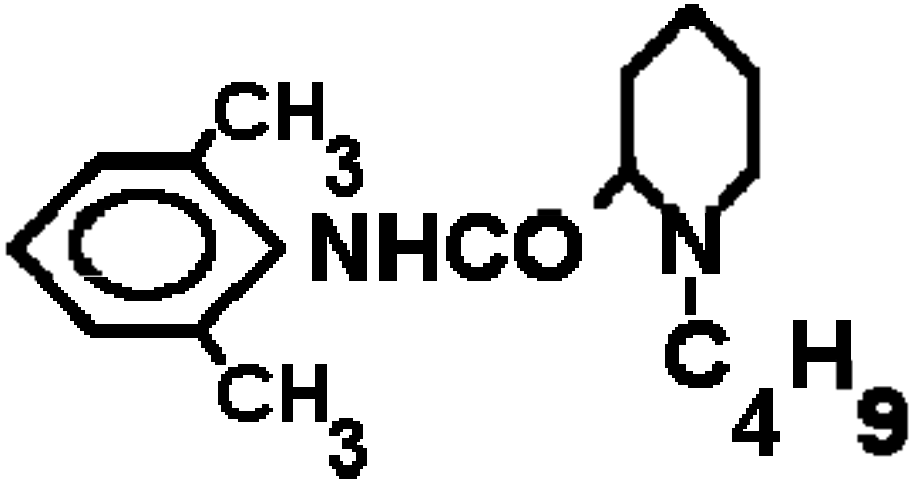
3) AT WRIST LEVEL :

	NERVE	INJECTION LANDMARKS
1	RADIAL	FROM RADIAL STYLOID PROCESS TO MIDDLE OF DORSUM WRIST – SUBCUTANEOUS INFILTRTATION
2	MEDIAN	BETWEEN PALMARIS LONGUS & FLEXOR CARPI RADIALIS, 2 cm PROXIMAL TO DISTAL PALMAR CREASE
3	ULNAR	MEDIAL TO ULNAR ARTERY, 2 cm PROXIMAL TO DISTAL PALMAR CREASE



PHARMACOLOGY [34-38]

BUPIVACAINE



It is a widely used amide local analgesic. Structure is similar to lignocaine except that the amine containing group is butylpiperidine. Levobupivacaine the s-enantiomer of bupivacaine is also available with less cardio toxicity

Mechanism of action:

Binds to specific sites located on the inner portion of sodium channels (interior gate or H gate) as well as obstructing sodium channels near their external openings to maintain these channels in inactivated closed states.

Pharmacokinetics:

Pka	8.1
Protein bounding	95%
Clearance	7.1 - 2.8 ml/min/kg
Volume of distribution	0.9 –1.02liters/kg
Half-life	1.2 - 2.4 hours
Peak time	0.17- 0.5 hours
Peak concentration	0.8 microgram/ml
Toxic plasma concentration	> 1.5micro gram /ml

Most important plasma protein binding site is alpha1 acid glycoprotein

Metabolism:

Metabolized by enzymes in the liver by aromatic hydroxylation, N-dealkylation, amide hydrolysis and conjugation. Metabolite is N-dealkylateddesbutyl bupivacaine.

Safe dose 2mg/kg

Used in spinal and epidural anaesthesia

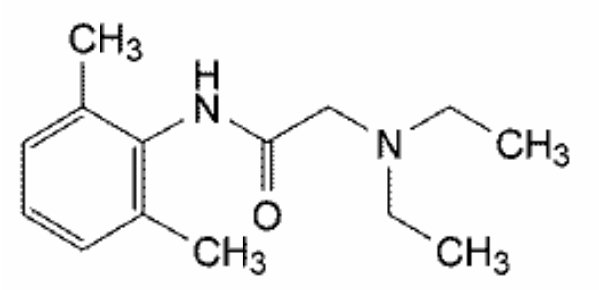
For peripheral nerve blocks

For infiltration analgesia

Toxicity

More cardio toxic than equieffective dose of lidocaine.Manifested clinically as ventricular and myocardial depression after inadvertent intra vascular administration of Bupivacaine.

LIGNOCAINE HYDROCHOLORIDE



Lignocaine was synthesized in 1943 in Sweden by Loffgren of AB Astra. It is chemically a tertiary amide, diethyl amino acetyl, 2, 6xylidinehydrochloride monohydrate. It is a local anaesthetic of moderate potency and duration but of good penetrative powers and rapid onset of action.

Mechanism of action:

Blocks the sodium channel in the inactivated closed state and hence prevents the initiation of conduction of action potential.

It is a stable compound at room temperature. Adrenaline prolongs the action of lignocaine and reduces the rate of systemic absorption by producing vasoconstriction and also reduces the systemic toxicity. Tachyphylaxis can occur with repeated injections. Concentration of adrenaline added is kept at 5 mcg /ml (1:200,000 dilutions) of Local anesthetic.

Pharmacokinetics:

Molecular weight	271
Pka	7.8
Protein binding	70%
Lipid solubility	2.9
Volume of distribution	1.3 L/Kg
Clearance	0.95 liters /minute
Elimination half-life	96 minutes
Toxic plasma concentration	>5microgram/ml

Metabolism

The principle metabolic pathway of Lidocaine is oxidative dealkylation in Liver to monoethylglycine xylilide followed by hydrolysis of this metabolite to xylidide. Hepatic disease can decrease the rate of metabolism of Lidocaine.

Dose

Safe dose 2 - 3mg/kg without adrenaline

5 –7mg/kg with adrenaline

Adrenaline up to 5 mcg/ml (1 in 200,000) does not give rise to systemic effects

Blood concentration of local anaesthetic drug is highest in intercostal block, followed by in order of decreasing concentration, epidural, Brachial plexus block and subcutaneous infiltration

Therapeutic uses:

Topical anaesthesia (2-4%)

EMLA cream (lignocaine 2.5% prilocaine 2.5%)

Local infiltration and peripheral nerve block

Intravenous regional anaesthetic (Biers block)

Regional anaesthetic (spinal / epidural)

Stress attenuation and prevention of rise in intra cranial tension

Suppression of the ventricular cardiac dysrhythmias

Toxicity

Allergic reactions: Due to the methyl paraben or similar preservatives, are structurally similar to paraaminobenzoic and allergic reactions are due to antibody stimulation by the preservative

Central nervous system: circumoral numbness, Tonic clonic seizures, CNS depression, hypotension, apnea. Seizures are produced by selective inhibition of the inhibitory neurons of CNS leaving unopposed excitatory neuron activity.

Transient radicular irritation (with 5% hyperbaric lignocaine)

Caudaequina syndrome

Cardiovascular System

Plasma concentrations 5-10 mcg /ml can produce profound hypotension due to relaxation of arteriolar smooth muscle and direct myocardial depression

Mechanism of Local anaesthetic toxicity:

Local anaesthetic toxicity is mainly due to prolonged blockade of both sodium and calcium channels. Although both lignocaine and Bupivacaine block cardiac sodium channels during systole, Bupivacaine dissociates more slowly than lignocaine and therefore significant fraction of sodium channels remain blocked during diastole. Thus the block is cumulative and substantively more than would be predicted by its local anaesthetic potency. A percentage of its cardiac toxicity is centrally mediated. Toxicity is enhanced by acidosis, hypoxemia, and hypercarbia.

Management of Local Anaesthetic Systemic Toxicity (LAST)

1) Securing the airway and ventilation with 100 % oxygen

2) Benzodiazepines for seizure management

3) Arrhythmia management according to ACLS protocol

4) **Lipid emulsion (20%):**

1.5 ml/kg bolus over 1 minute followed by 0.25 ml/kg/min infusion

Infusion to be continued for 10 minutes after cardiovascular stability.

VASOCONSTRICTORS

When used with a local anaesthetic, adrenaline a commonly used vasoconstrictor is found to prolong the duration of block by delaying the absorption and also by lowering the peak blood level, to reduce the incidence of systemic toxicity of the local anaesthetic.

Though its use is controversial in micro vascular re-implantation and reconstructive surgeries of the hand, due to possible adverse consequences of decreased overall arm blood flow, it was used in the present study,with the aim of reducing the incidence of toxicity due to lignocaine since it is the drug of choice for the initial blockade because of its shorter onset of action.

Adrenaline

Epinephrine (adrenaline) is the prototype drug among the sympathomimetics.

Functions

- Agonist of α- adrenergic, β 1 and β2 receptors.
- Poorly lipid soluble hence lack of cerebral effects.

Uses

- Addition to local anaesthetic solution in order to decrease systemic absorption and to prolong duration of action.
- Treatment of life threatening allergic reaction.
- During CPR as a very important therapeutic drug.
- Continuous infusion to increase myocardial contractility.

REVIEW OF LITERATURE

1. DK Sahu et al[10]conductedlateral approach of supraclavicular brachial plexus block using peripheral nerve stimulator in 82 patients scheduled to undergo elective surgery of the upper limb below the midarm.

The incidence of vessel puncture in this study was 20 %. In this study none of the patient developed pneumothorax because the direction of needle was parallel to the clavicle in this study.The other complications of brachial plexus block like Horner's syndrome, recurrent laryngeal nerve blockade did not occur in this study when compared to Pham Dang et al[44]study.

Dr.Sahu et al had 92% success rate when compared to other approaches of supraclavicular block.

2. Dilip Kothari et al[9]conducted lateral approach of supraclavicular block using paraesthesia technique 250 patients undergoing upper limb surgery.

He concluded that in this study vessel puncture and other complications were very minimal when compared to other studies. He had 98 % of block success rate.

3. **Hempel V et al[8]** conducted continuous supraclavicular block using 20 G, 5.1cm Teflon cannula in 100 patients.

In those periods it was used for continuous brachial plexus anaesthesia for prolonged surgery, here cannula was inserted using paraesthesia technique in the longitudinal axis by supraclavicular approach.

The risk of dural puncture and epidural puncture was less when compared interscalene block described by Winne[6].

4. **Nguyen HC et al[15]** conducted transcalene block by using nerve locater in 27 patients of ASA I-III undergoing major surgery of shoulder and upper arm.

They concluded that complications of interscalene blocks described by Winne[6] such as inadvertent injection into the vertebral artery, pneumothorax, spinal or epidural blockade can be avoided by this technique.

5. **Brown DL[40]**

The author conducted this study in 12 volunteers. This modified supraclavicular block was done in parasagittal plane that is the needle

was inserted at the lateral most sternocleidomastoid insertion over clavicle, in a perpendicular plane.

The MRI data suggested that para sagittal technique had less chance of pneumothorax when compare to classical approach.

This technique minimizes the need to angle the needle used during supraclavicular block as directly at the pleura and lung. Another potential advantage of this approach was needle insertion point (lateral border of sternocleidomastoid) easily identified when compared to other approach entry site.

6. Leonard B[41] et alstudy compared axillary block and supraclavicular block. The author concluded that the axillary approach had higher success rate and low complications.

Other complications of supraclavicular block like pneumothorax can be avoided.

7. Robert S. Weller et al[42]

The aim of the study was to find out the ideal brachial plexus block in terms of easy procedure and complete anaesthesia without major complications.

It should be performed without major alteration in patient's position. It should be available for continuous catheter placement also.

Among the various approaches, supraclavicular came almost to the ideal one.

8. David L.Brownet al [43]

Studyshows that Injection of local anaesthetic above the clavicle blocks musculocutaneous and axillary nerves which is frequently missed on the axillary approach. Blocking lower than first rib would eliminate the potential for pneumothorax or for missing the ulnar segment of the medial cord. It also blocks intercostobrachial nerve, which is not blocked on any of the other approaches.

SCB does not require positioning of arm as does the axillary approaches.

9. Pham-Dang C et al[44].

In this study author performed inter sternocleidomastoid approach of supraclavicular block using peripheral nerve locator in 150 patients scheduled for elective surgery of the upper limb.

He concluded that inter sternocleidomastoid technique can be used for continuous catheter analgesia because when compared to other

supraclavicular approach, less chance of catheter misplacement into subclavian vein and very minimal risk of pneumothorax in this study.

10. Dupre LJ et al [45]

The author was researching various landmarks for supraclavicular block and he concluded to take external jugular vein as a landmark.

Nerve locators

11. Carlo D Franco et al[46]

In this study author had two end points for drug injection in supraclavicular block performed using peripheral nerve stimulator. In one group the drug was injected at 0.5 mA and in another at the current of 0.9 mA .

The author concluded a supraclavicular block can be performed withcurrent starting from 0.9 mA to 0.5 mA.

12. In 1990 Zaharai DT et al described the use of nerve stimulator which allows accurate nerve blocks without causing paraesthesia and decreasing the possibility of nerve injury[47].

13. In 1985 Smith DC et aldescribed an inexpensive portable nerve stimulator which is used to enhance the ease and effectiveness of peripheral nerve locator[48].

14. In 1984 Bashein G et al and Ford et al in their independent studies concluded that in nerve stimulator assisted nerve blocks, insulated needles more precisely located the peripheral nerves than uninsulated ones[49].

15. In 1980 Yasuda I et al described the use of nerve stimulator with insulated needle in Supraclavicular brachial plexus block.

MATERIALS AND METHODS

This is a prospective randomized study conducted at Government Stanley Hospital, attached to Stanley Medical College, Chennai . Sixty patients of ASA grade I or II of either sex undergoing surgery below mid arm in plastic surgery department were randomly allocated into two groups S and L. Each group comprises of 30 patients. Surgery was done under supraclavicular brachial plexus block using peripheral nerve stimulator. In group S subclavian perivascular approach and in group L lateral approach was used.

PROCEDURE

After ethical committee approval, informed consent was obtained from the patients. Intravenous access was obtained. Anaesthesia machine checked resuscitative equipment and drugs were kept ready.

Inclusion criteria :

Age 18-65 yrs

ASA I & II patients

Surgery of upper limb below midarm.

Exclusion criteria :

ASA III & IV

Clavicular fracture.

Coagulopathy

Pregnancy

Severe cardiopulmonary compromise

Mentally challenged or language barrier

Anatomical variations

Drugs and Equipment:

Group S and L -15ml of 2% lignocaine

15ml of 0.5% bupivacaine

5mcg/ml of adrenaline /ml

Standard monitoring- ECG/ BP/pulse rate/ SpO2

Sterile towels and gauge packs

20ml syringe with local anaesthetics

Sterile gloves,marking pens,and surface electrodes

One 25G needle for skin infiltration

A 5cm long,short bevel,insulated nerve stimulating needle

Peripheral nerve stimulator

Standard monitoring was appliedand IV line was secured.

TECHNIQUE

SUBCLAVIAN PERIVASCULAR APPROACH OF BRACHIAL PLEXUS BLOCK

The patient is positioned supine with the head faced slightly to the contralateral side. A small towel roll is placed behind the shoulder to make the supraclavicular area prominent. The arm rests besides the body.

The outline of clavicle is drawn on the skin and the midpoint of the clavicle is marked. Needle insertion point is marked just above this midpoint which is just lateral to the sternocleidomastoid insertion.

The subclavian artery pulse serves as a reliable landmark as the plexus lies immediately cephaloposterior to the artery.

The operator stands at head end of the patient on the ipsilateral side. Under strict aseptic precautions skin infiltration done with 1% lignocaine at the entry point.

The insulated 22G, 5cm block needle is inserted at 45 degree caudally towards theipsilateral toe.The needle is advanced till a pop off is felt which signifies the entry into the perivascular sheath. Now the nerve locator is switched on and the stimulating current set at 2.0mA, 2Hz, 0.1ms. The needle is advanced until finger flexion or extension visible.

Then current is decreased to 0.5 mA. After negative aspiration for blood,0.5 ml/ kg of local anaesthetic mixture containing 0.25 % bupivacaine and 1 % Lignocaine with 5μg/ml of adrenaline is injected (not exceeding 30 ml).

GOAL: Is to achieve a hand twitch (preferably flexion of finger and thumb) using a current of 0.5 mA

Care was taken so that the toxic dose of the local anaesthetics was not exceeded according to the weight of the patient.

LATERAL APPROACH OF SUPRACLAVICULAR BLOCK

The patient is positioned supine with the head faced slightly to the contralateral side. A small towel placed behind the shoulder to make the supraclavicular area prominent. The arm rests besides the body.

Clavicle outline is marked on the skin and divided into three segments. At the junction of inner two third and outer one third , one cm above the clavicle insertion point is marked.

The operator stands at the head end. Under strict aseptic precautions, skin is infiltrated with 1% lignocaine at the needle insertion point. The insulated 22G, 5cm block needle is inserted at an angle of 20 degree to the skin, parallel to clavicle deep to the external jugular vein.

Stimulating current is set at 2.0mA, 2Hz. Once the finger twitch either flexion or extension is obtained the current is decreased to 0.5 mA. After negative aspiration for blood, 0.5 ml/ kg of local anaesthetic mixture containing 0.25 % bupivacaine and 1 % Lignocaine with 5µg/ml of adrenaline is injected (not exceeding 30 ml).

GOAL: Is to achieve a hand twitch (preferably flexion of finger and thumb) using a current of 0.5 mA

Care was taken so that the toxic dose of the local anaesthetics was not exceeded according to the weight of the patient.

PARAMETERS OBSERVED

1. NUMBER OF ATTEMPTS :

If the needle is withdrawn till the skin and redirected it is calculated as an attempt.

2. PROCEDURE TIME :

Time calculated from the needle insertion till the starting of drug injection.

3. SUCCESSFUL BLOCKADE :

Defined as a blockade of the four nerves to the elbow (musculocutaneous, median, ulnar and radial). If a nerve territory was spared a rescue block was administered. If the patient still experiences pain or discomfort general anaesthesia was administered.

4. VITAL PARAMETERS :

Pulse rate

Blood pressure

Oxygen saturation

ECG

5. COMPLICATIONS:

Pneumothorax

Accidental vessel puncture

Hematoma

Phrenic nerve palsy

Horner’s syndrome.

OBSERVATION AND RESULTS

This study comprised of two groups. The patients were randomly selected.

Group-L : 30 patients received Supraclavicular block by Lateral approach.

Group-S : 30 patients received Supraclavicular block by Subclavian perivascular approach.

Statistical Tools

The data were analyzed using SSPS (Statistical package for Social Science) Ver 16.01. The data collected were scored and analyzed. Continuous variable were presented as means with Standard deviation (Sd) and categorized variables were presented as frequency and percentages. Student t test was used for testing the significance of all the variables in both the group. Qualitative data was analyzed by using Chi square test. All the statistical results were considered significant at p value < 0.05.

1: AGE DISTRIBUTION

Age distribution in Lateral approach of supraclavicular block group varies from 20 years to maximum of 40years ,with a mean value of 26.57 years, and standard deviation of 6.22.

Age distribution in Subclavian perivascular approach of supraclavicular block group varies from 20 years to maximum of 40 years, with the mean value of 27.50 years, and standard deviation of 7.03 (As shown in table.1&2, Fig 1)

Table-1: Age Distribution

Sex	**Lateral Approach**	**Subclavian Perivascular**
Mean	26.57	27.50
Sd	6.22	7.03
t-value	**0.55**	
Df	**58**	
Significant	**0.59 (Not Significant)**	

Table-2 :Age Distribution

Age	Lateral Approach	Subclavian Perivascular	Total
Minimum	20	20	20
Maximum	40	40	40
Range	**20**	**20**	**20**
Mean (sd)	**26.57 (6.22)**	**27.50 (7.03)**	**27.03 (6.60)**

AGE DISTRIBUTION

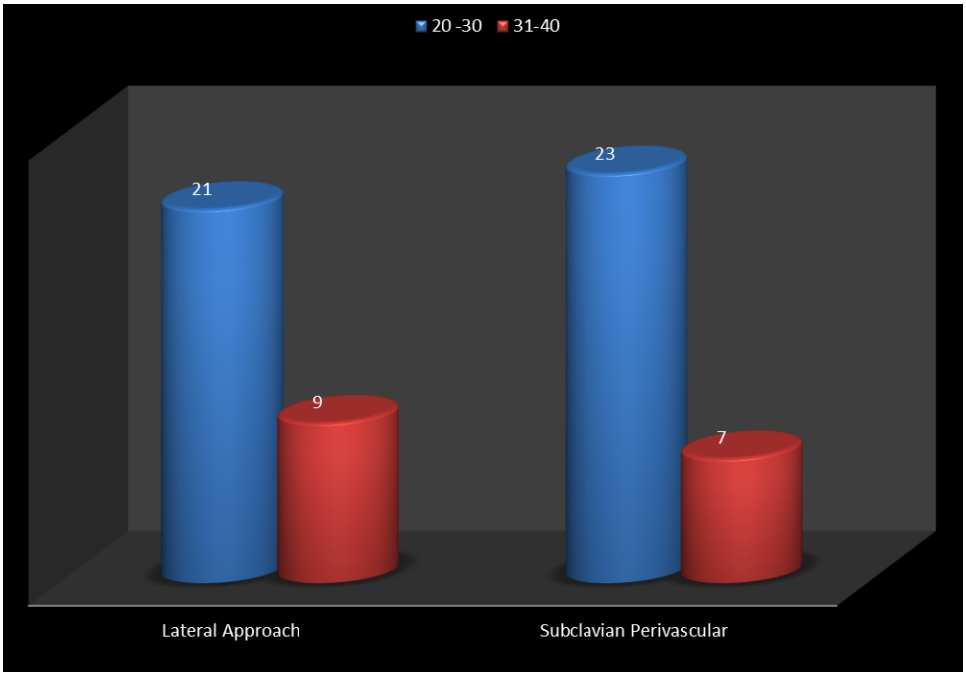


Fig 1.

2: SEX DISTRIBUTION

Sex distributions in Lateral approach group - males were 20, and the rest were females and in Subclavian perivasculargroup – males were 20, and the rest were females . (As shown in table.3& Fig.2)

Table-3:Sex Distribution of the sample

SEX	LATERAL APPROACH		SUBCLAVIAN PERIVASCULAR		TOTAL	
	N	%	N	%	N	%
MALE	20	66.67	20	66.67	40	66.67
FEMALE	10	33.33	10	33.33	20	33.33
TOTAL	**30**	**100**	**30**	**100**	**60**	**100**

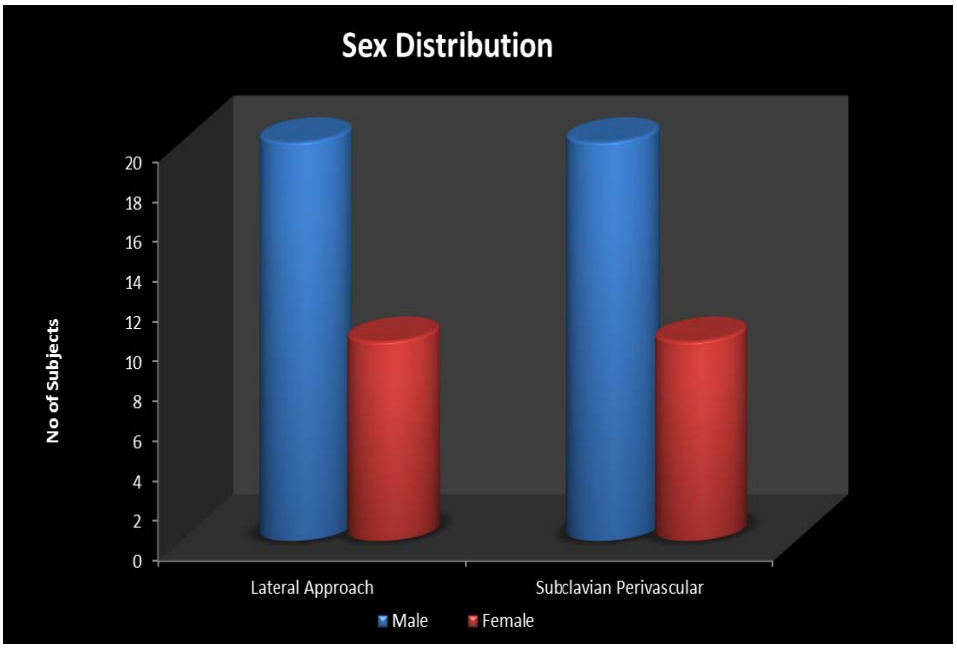


Fig 2.

3: NUMBER OF ATTEMPTS

In Lateral approach 2 attempts in 1 case (3.3%) and single attempt in 29 cases (96.7%)

In Subclavian perivascular approach 2 attempts in 4 cases (13.3%) and single attempt in 26 cases (86.7%)

Applying Chi square tests, it was found to be statistically insignificant. The 'p' value of 0.16 was statistically insignificant. (table:4& Figure: 3)

Table-4: Number of Attempts

Number of Attempts	Lateral Approach		Subclavian Perivascular		Total	
	N	%	N	%	N	%
1	29	96.70	26	86.70	55	91.70
2	1	3.30	4	13.30	5	8.30
Chisquare value	**1.96**					
Df	**1**					
significant	**0.16 (Not Significant)**					

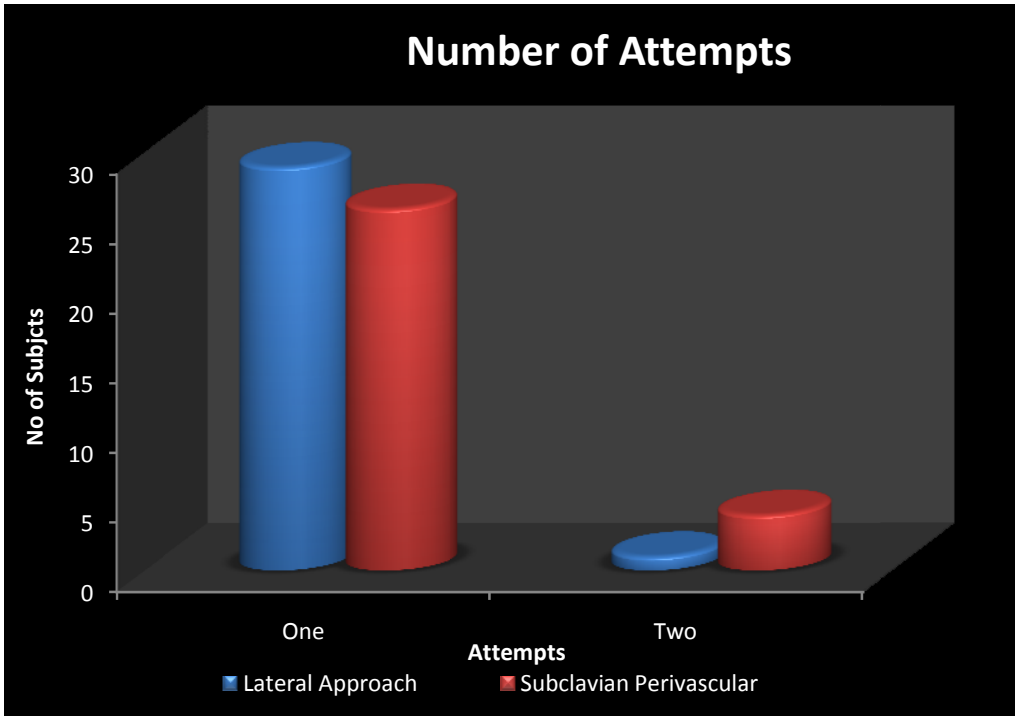


Fig 3.

4: PROCEDURE TIME

Time to perform block in Lateral approach group ranges from minimum of 3 minutes to the maximum of 6 minutes, with the mean of 3.57, and the standard deviation of 0.59.

In Subclavian perivascular approach group, the time to perform the block ranges from 3minutes to the maximum of 6minutes , with the mean of 3.81min, and the standard deviation of 0.74.

The 'p' value of 0.18 was not significant. (Table: 5& fig 4)

Table-5: Procedure Time

Procedure Time	Lateral Approach	Subclavian Perivascular
Mean (Min.Sec)	3.57	3.81
Sd	0.59	0.74
t-value	**1.37**	
Df	**58**	
Significant	**0.18 (Not Significant)**	

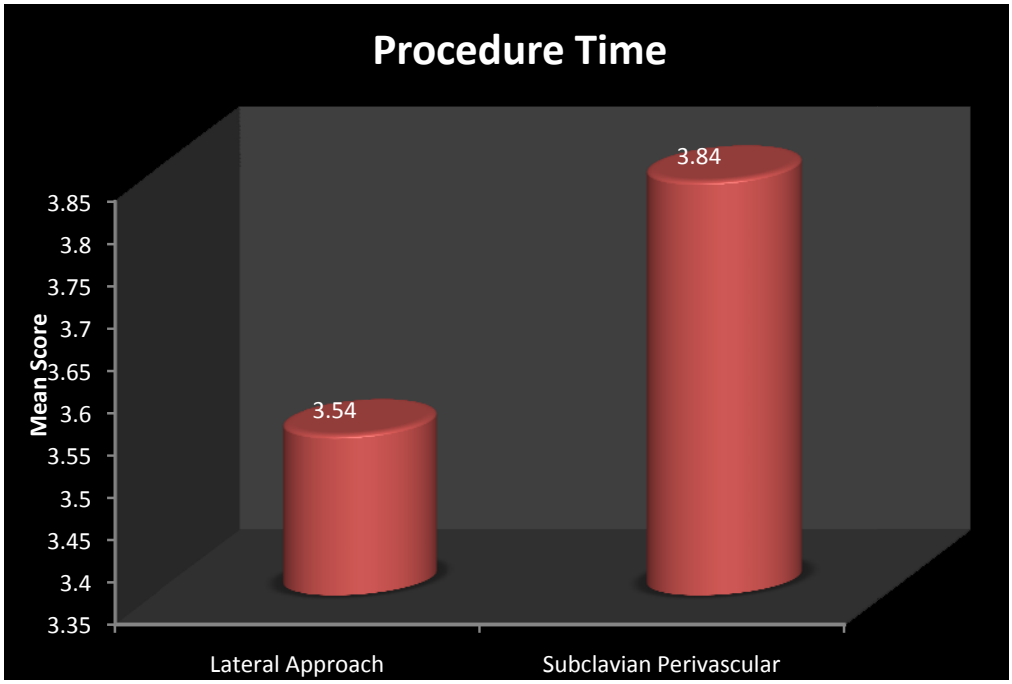


Fig 4

5 :SUCCESS RATE

Successful block, that is involvement of four terminal nerves: In Lateral approach 2 out of 30 patients block failed (6.7 %), the success rate was 93.3 %. In Subclavian perivascular approach 2 out of 30 patients block failed (6.7 %), the success rate was. Applying Chi square tests, it was found to be statistically insignificant. The ‘p’ value was statistically insignificant. (Table: 6& Figure: 5)

Table-6 :Success rate

Success	Lateral Approach		Subclavian Perivascular		Total	
	N	%	N	%	N	%
Yes	28	93.30	28	93.30	56	93.30
No	2	6.70	2	6.70	4	6.70
Total	30	100	30	100	60	100
Chi square value	**0.001**					
Df	**1**					
significant	**1.00 (Not Significant)**					

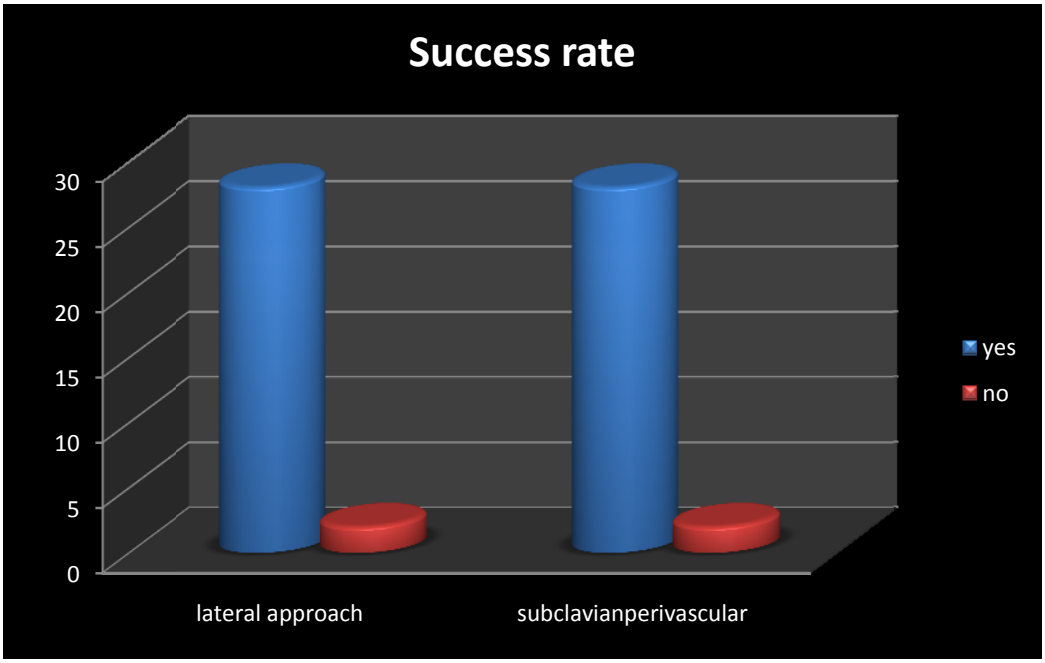


Fig 5.

6: COMPLICATIONS

The incidence of vessel punctures in Lateral approach group was nil (0%). In Subclavian perivascular approach it was 4 (13.3%). Applying Chi square tests, the ‘p’ value 0.04which is **statistically significant**.

No other complication was recorded in both the group S and group L. (Table7, fig 6)

Table-7 :Complication

Complication	Lateral Approach		Subclavian Perivascular		Total	
	N	%	N	%	N	%
Yes	0	0	4	13.30	4	6.67
No	30	100	26	86.70	56	93.33
Total	30	100	30	100	60	100
Chi-square value	**4.29**					
Df	**1**					
significant	**0.04 (Significant)**					

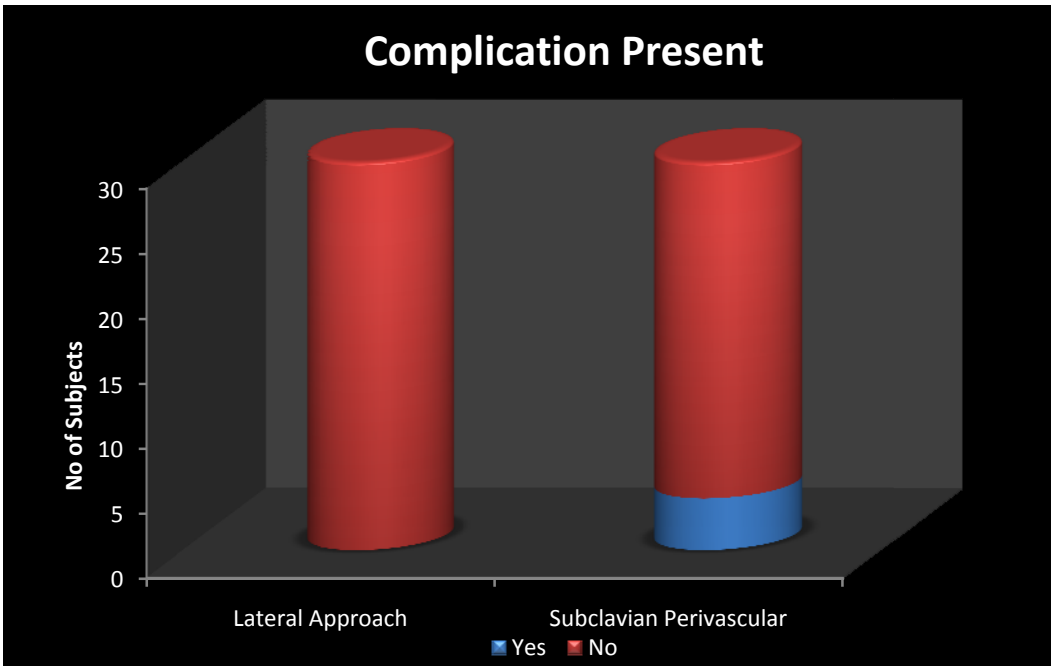


Fig 6.

DISCUSSION

Brachial plexus block like other regional anesthesia technique, offers specific advantages to the patient, surgeon, anesthesiologist, and surgical procedures which may not be true for general anesthesia.

It is possible and desirable for the patient to remain ambulatory and it's devoid of other complications due to general anaesthesia. The use of brachial plexus block may minimize adverse effects ofgeneral anesthesia like polypharmacy, postoperative respiratory compromise and postoperative pain, etc. Patients who present for surgery in theupper extremity with risk of vascular compromise may improve as soon as the pain has been relieved and vasodilatation has been produced by the blockade.

In 1884 **Wiiliam Halsted** first performed the brachial plexus block by applying cocaine solution in the roots of the brachial plexus after exploring the neck of the patient. In 1911 German surgeon **Kulenkampff**demonstratedthefirst PERCUTANEOUS BRACHIAL PLEXUS BLOCK,he subjected himself to the block. Later **Hirschel**[4]demonstrated thesame percutaneous approach of brachial plexus block from axilla.

In 1912 **Kappis**[57]demonstrated POSTERIOR CERVICAL PLEXUS BLOCK using fascial click and paraesthesia which was later modified by **Heindenbein**[58]**.** This interscalene block was reviewed by **Winne**[59]in 1970 and he placed a needle in the interscalene groove (ANTERIOR INTERSCALENE APPROACH) and injected the drug after eliciting paraesthesia. Accidental vertebral artery injury and epidural drug injection were reported in this technique. Hence it was modified by **Meier and Borgeat,** whothey placed the needle along the floor of the groove whereas in winne's approach the needle was directed medially towards the transverse process.

Because of the continuation of neural sheath throughout the brachial plexus **Winne**and **Collins**[5]demonstrated the SUBCLAVIAN PERIVASCULAR APPROACH of brachial plexus block using paraesthesia technique in 1964.

All the approaches described above were done using land marks, identifying fascial clicks or paraesthesia. But paraesthesia technique has increased risk of nerve injury, it produces unpleasant sensation to the patients and it has subjective and objective variations.

In 1955, using electrical stimulation with an insulated needle **Paerson**demonstrated the motor nerve localization. The first

transportable nerve stimulator was devised by **Greenbalt and denson**in 1962. In 1969 **Wright** demonstrated the nerve block using nerve stimulator.

To avoid the complications of classical supraclavicular approach, in 1979 **Vongvises**[60]demonstrated PARASCALENE APPROACH using peripheral nerve stimulator where the needle was placed in the lower interscalene groove. This was modified by **Moorthy**[61]in 1991 as LATERAL PARAVASCULAR APPROACH. He marked the axillary artery course from the subclavian artery using Doppler and inserted the needle lateral and parallel to the artery course.

In 2003 **DilipKothari**[9]had described the LATERAL APPROACH of supraclavicular block using paraesthesia technique which was later modified by **DK Sahu**[10] in 2010 using peripheral nerve stimulator.

Several modifications of the classical supraclavicular approach have been made like interscalene, trans scalene, intersternocleidomastoid, the plumb – pop technique, parascalene, lateral para vascular, lateral approach technique which have their own merits and demerits.

Supraclavicular block (Subclavian perivascular) as described by **Winne and Collins** in1964, has been a very widely used approach due its

rapid onset, dense blockade and high success rate. The risks of complication are rare with experienced hands, especially when a nerve locator is used.

The latest Lateral approach was demonstrated by **DK Sahu** in 2010 using peripheral nerve stimulator. He had very high success rate and fewer complications when compared to all other approaches.

Hence we decided to compare the efficiency of the lateral approach with the subclavian perivascular approach which is routinely practiced in our institute in terms of number of attempts, procedure time, success rate and complications in patients undergoing surgery below midarm.

This is a prospective randomized study conducted in sixty patients of ASA grade I or II of either sex undergoing elective surgery below mid arm whowere randomly allocated into two groups S and L. Each group comprises of 30 patients. Surgery was done under supraclavicular brachial plexus block using peripheral nerve stimulator. In group S subclavian perivascular approach and in group L lateral approach was used.

As far as **NUMBER OF ATTEMPTS** was concerned, in thesubclavian perivascular approach group 4 out of 30 cases required 2

attempts toperform the supraclavicular brachial plexus block. This was due to accidentalvessel punctures in 2 cases and inability to obtain desired nerve stimulatorresponse even after minimal manipulations.

In the lateral approach group 2 attempts required in only one case because of difficulty in getting desired response in the first attempt of that case.

So we obtained a96.7% success rate in performing block in single attempt for Lateral approach groupand 86.7% for Subclavian perivascular approach group.

Applying Chi square tests, the 'p' value of 0.16 was statisticallyinsignificant.

As far as **PROCEDURE TIME** was concerned,Lateral approach was performed with the mean time of 3.57 minutes, and the Subclavian perivascular approach groupwith the mean time of 3.81minutes.

Applying Chi square test, the 'p' value of 0.18 was not significant.

There was no difference in time to perform a block in both approaches because both techniques haddefined landmarks for the block.

As far as **SUCCESS RATE OF BLOCK** was concerned,Brand et al[52] using paraesthesia technique had reported 84 % of success rate and Moore et al[54] had 74 % of success rate using peripheral nerve stimulator performed in sagittal plane.

In our study we had 93.3 % success rate in subclavian perivascular approach using peripheral nerve stimulator.

In lateral approach Kothari et al[10] had 98 % success rate using paraesthesia technique and DK Sahu et al[9] had 92 % using peripheral nerve stimulator.

In our study we had 93.3 % success rate in lateral approach technique using peripheral nerve stimulator.

We had similar success rate in both techniques because both of them were done using peripheral nerve stimulator; volume and concentration of the drugs used were similar. Most importantly, in both approaches drugs were deposited near the trunk which is the compact area of the brachial plexus where we get a high success rate.

As far as **COMPLICATIONS** was concerned, DK Sahu et al[9] reported 20 % of vessel puncture and Kothari et al[10] reported 6 % of vessel puncture in lateral approach technique, but none of our patient in

lateral approach group had this complication. But in subclavian perivascular approach groupof our study, 4 cases had accidental vessel puncture (13.3%) which was statistically significant.

None of our patient developed pneumothorax, but Brand[52] et al reported 6% pneumothorax and for Moore et al[54] it was 1.5 %.

Other complications like accidental central neuraxial blockade reported by Ross[55]and kumar[56]et al were not observed in our study. PhamDang[44] et al reported unilateral diaphragmatic paralysis because of phrenic nerve involvement in 60 % of cases but such complication was not observed in our study.

SUMMARY

60 patients of ASA grade I and II undergoing upper limb surgeries were randomly assigned into two groups, Group L and Group S

In this randomized prospective study, 30 patients received Lateral approach of supraclavicular brachial plexus block in group L, and other 30 patients received a Subclavian perivascular approach of supraclavicular brachial plexus block in group S.

Surgeries below the level of mid arm were selected for this study.

Parameters observed were – number of attempts, procedure time, complications, success rate.

Study shows that:

1. 2 attempts wereneededto perform a block in 4patients of Group S and 1 patient of Group L. But the number of attemptsrequired to perform a block in both group was statistically insignificant.

2. Time to perform a block was not statistically significant in Group L andGroup S.

3. The incidence of complications in the form of vascular punctureobserved in 4 patients of Group S, which wasstatistically **significant** when compared to group S.

4. Success rate of blocking four terminal nerves (musculocutaneous, ulnar, radial, median,) was not statistically significant in group L when compared to group S.

CONCLUSION

From our study it is inferred that in Supraclavicular brachial plexus block using nerve stimulator, Lateral approach is superior to subclavian perivascular approach in terms of less complication rate. But both approaches have high success rate if it is performed precisely using nerve stimulator.

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PROFORMA

Name	:	Serial No	:
Age/ sex	:	Date	:
Weight	:	IP no	:
Diagnosis	:	Group	: L /S
Surgery	:	Co morbid	:
ASA	:	consent	:
Last oral intake	:		
Monitors	:		

Baseline HR -

BP -

SpO2 -

Details of nerve block :

	LATERAL APPROACH	**SUBCLAVIAN PERIVASCULAR**
No of attempts		
Procedure time		
Success		
Complications		

Duration of surgery :

நோயாளி தகவல் தாள்

விளா எலும்புக்கு மேலே கை நரம்புகளை மறத்துப்போக (supraclavicular nerve block) செய்யும் ஆய்வு லேட்ரல் (lateral) முறை மற்றும் சப்கிலேவியன் ஆட்ரீ பெரிவாசுக்லார் (subclavian perivascular) முறை ஒப்பிடும் ஆய்வு.

நோயாளிகளுக்காண தகவல்

ஆராய்ச்சியின் நோக்கமும், ஆதாயங்களும்

உங்களுக்கு திட்டமிடப்பட்ட இந்த மருத்துவ ஆய்வானது விளா எலும்புக்கு மேலே கை நரம்புகளை மறத்துப்போக செய்யும் ஆய்வு லேட்ரல் முறை மற்றும் சப்கிலேவியன் ஆட்ரீ பெரிவாசுக்லார் முறை ஒப்பிடும் ஆய்வு.

பொதுவாக இத்தகைய அறுவை சிகிச்சைகள் சுவாசக்குழாயில் டியூப் (endotracheal tube general anaesthesia) மூலம் மயக்க மருந்து கொடுக்கப்படும். ஆனால் இம்முறையில் முழு மயக்கத்தினால் வரக்கூடும் விளைவுகளை தவிர்க்கலாம், அறுவை சிகிச்சையின் பின்பும் சில மணி நேரங்களுக்கு வலி இல்லாமல் இருக்கும்.

ஆய்வு முறை:

அறுவை சிகிச்சை அறைக்குள் சென்றதும் இரத்த நாளத்தில் மருந்துகள் செலுத்துவதற்க்காக சிறு ஊசி (venflon) போடப்படும். பின்பு விளா எலும்புக்கு மேலே கை நரம்புகளை மயக்க மருந்துகள் கொடுத்து மறத்துப்போக செய்ய லேட்ரல் முறை அல்லது சப்கிலேவியன் ஆட்ரீ பெரிவாசுக்லார் முறை கையாளப்படும்.

உண்டாகக்கூடிய இடர்கள்:

அனைத்து மயக்க மருந்து மற்றும் மயக்க முறைகளுடன் இருப்பது போலவே இந்த முறையிலும் சில எதிர்பாரா இடர்கள் நடைபெறலாம். அறிதாக நுரையீரல் அல்லது அதனை சுற்றி உள்ள உறையினை சேதப்படுத்தலாம் (pnemothorax), இரத்த நாளங்களை (hemorrhage) காயப்படுத்தலாம்.

<u>ஆய்வில் உங்கள் உரிமைகள்</u>:

உங்கள் மருத்துவப் பதிவேடுகள் மிகவும் அந்தரங்கமாக வைத்துக் கொள்ளப்படும். இந்த ஆய்வின் முடிவுகள் அறிவியல் பத்திரிக்கைகளில் பிரசுரிக்கப்படலாம். ஆனால் பெயரை வெளியிடுவது மூலம் நீங்கள் அடையாளம் காட்டப்படமாட்டீர்கள். இந்த ஆய்வில் பங்கேற்பது தன்னிச்சையானது மற்றும் காரணங்கள் எதையும் கூறாமலேயே நீங்கள் ஆய்வில் இருந்து விலகியும் கொள்ளலாம். எப்படி இருந்தாலும் உங்களுக்கு தகுந்த மயக்க மருந்து கொடுத்து அறுவை சிகிச்சை செய்யப்படும். இந்த ஆய்வில் ஏதேனும் பக்க விளைவுகள் ஏற்பட்டால் உங்களுக்கு முழு சிகிச்சை மருத்துவக் குழுவினரினால் அளிக்கப்படும்.

நாள்|:

நோயளியின் கையொப்பம் / இடது
பெறுவிரல் ரேகை
(மருத்துவரால் படித்துக்காட்டப்பட்டது)

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு

விளா எலும்புக்கு மேலே கை நரம்புகளை மறத்துப்போக (supraclavicular nerve block) செய்யும் ஆய்வு லேட்ரல் (lateral) முறை மற்றும் சப்கிலேவியன் ஆட்டீ பெரிவாசுக்லார் (subclavian perivascular) முறை ஒப்பிடும் ஆய்வு.

ஆராய்ச்சி நிலையம் : அரசு ஸ்டான்லி மருத்துவமனை
சென்னை - 600001

பங்கு பெறுபவரின் பெயர் : வயது :

விலாசம் : பாலினம் : ஆண்/பெண்

இதனை (✓) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மறுத்துவ ஆய்வின் விபரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் இவ்வாய்வில் தன்னிச்சையாகத்தான் பங்கேற்கிறேன். எந்த காரணத்திலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் இவ்வாய்வில் இருந்து விலகிக் கொள்ளலாம் என்றும் அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனையின் முடிவுகளையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதை பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் ஈடுபட முழுமனதுடன் ஒப்புக்கொள்கிறேன். இந்த மயக்க முறையினால் ஏற்படக் கூடிய பின் விளைவுகள் பற்றி எனக்கு விளக்கமாக தெரிவிக்கப்பட்டது. ☐

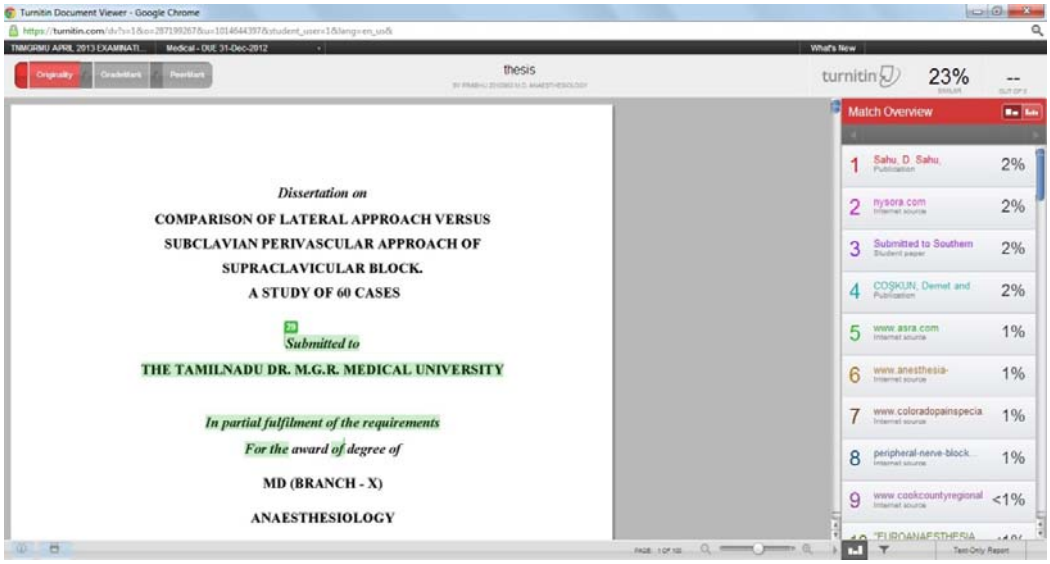
இந்த ஆய்வில் விளா எலும்புக்கு மேலே கை நரம்புகளை மறத்துப்போக செய்யும் ஆய்வு லேட்ரல் முறை மற்றும் சப்கிலேவியன் ஆட்சீ பெரிவாசுக்லார் முறை ஒப்பிடும் ஆய்வு என அறிந்து முழு மனதுடன் சம்மதிக்கிறேன்.

நோயளியின் கையொப்பம் ..... இடம்..... தேதி .....

இடது பெறு விரல் ரேகை (மருத்துவரால் படித்துக்காட்டப்பட்டது)

ஆய்வாளரின் கையொப்பம் ..... இடம்..... தேதி.....

ஆய்வாளரின் பெயர் .....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SUBCLAVIAN PERIVASCULAR APPROACH OF
SUPRACLAVICULAR BLOCK.
A STUDY OF 60 CASES
Submitted to
THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY
In partial fulfilment of the requirements
For the award of degree of
MD (BRANCH - X)
ANAESTHESIOLOGY

MASTER CHART

S.No	GROUP	NAME	AGE/SEX	IPNo	WEIGHT (Kg)	DIAGNOSIS	PROCEDURE	PREOP HR	BP	SPO2	ATTEMPTS	PROCEDURE TIME	COMPLICATION	SUCCESS
1	S	VENKATESH	21/M	322633	46	PTS ZONE II	TENDON RECON	72	112/68	99	1	3m	N	Y
2	S	VENNILA	20/F	315011	40	SOFT TISSUE TUMOR R H	EXCISION	84	124/86	99	2	5m 30s	VESSEL INJURY	Y
3	L	SARAVANAKUMAR	21/M	322634	52	PBSC L HAND	CONTRACTURE RELEASE	70	120/80	99	1	3m 30s	N	Y
4	L	BALAJI	23/M	323860	58	PT RAW AREA R HAND	SSG	66	104/68	99	1	4m	N	N
5	S	PANCHALI	27/F	324215	50	RETAINED FB R FA	REMOVAL	92	110/70	99	1	4m	N	Y
6	L	SATHIYA	29/F	322908	48	PBSC L HAND	RELEASE & SSG	90	106/74	99	2	6m	N	Y
7	L	MURUGESAN	22/M	325088	60	PTS ZONE II	TENDON RECON	82	110/74	99	1	3m 45s	N	Y
8	S	VIJAYA NIRMALA	30/F	325067	50	L PTRA FOREARM	SSG	64	100/60	99	1	4m 10s	N	Y
9	L	VISHALI	20/F	317794	42	PT CUT ZONE II	FDD RECON	76	112/70	99	1	4m	N	Y
10	S	DEENAN	40/M	325241	56	PTS R HAND / # PPX	ORIF WITH K WIRE	92	134/80	99	2	6m	VESSEL INJURY	N
11	L	SENTHILKUMAR	28/M	325460	52	R HAND CRACKER BURST	SSG	68	110/60	99	1	3m 45s	N	Y
12	L	NIRMAL	32/M	321857	62	PTS L FA	BISCEPS LENGTHENING	90	114/82	99	1	4m	N	Y
13	S	LAKSHMI	35/F	325145	54	CARPAL TUNNEL SYNDROME	RELEASE	78	120/70	99	1	4m	N	Y
14	S	SELVI	28/F	323013	58	PBSC R INDEX	RELEASE & CFF	68	104/62	99	1	3m 45s	N	Y
15	L	HEMALATHA	21/F	3630	46	NEUROFIBROMA L FA	MEDIAN N EXP & REPAIR	96	132/80	99	1	3m 45s	N	Y
16	S	ARPUTHARAJ	24/M	324367	62	PTS R FA	MEDIAN N EXP & REPAIR	84	120/80	99	1	4m	N	Y
17	S	LOGANATHAN	40/M	321971	60	PTS R INDEX	CONTRAC RELEASE, CFF	82	124/92	99	1	3m 45S	N	Y
18	L	VIJAYAKUMARI	25/F	323879	50	PTS R RING F	CFF	70	110/70	99	1	3m	N	Y
19	L	NAGARAJ	30/M	322335	60	PBSC L HAND	RELEASE & SSG	80	130/90	99	1	4m	N	Y
20	L	PARVATHY	24/F	324948	52	TRIGGER THUMB	TRIGGER RELEASE	74	112/68	99	1	3m 15s	N	Y
21	S	REVATHY	22/F	325442	48	CHRONIC DISLOCATION R IND	ORIF WITH K WIRE	68	120/66	99	1	3m 30s	N	Y
22	L	MINTO	20/M	325760	58	PTRA L THUMB	DEBRIDEMENT GROIN FLAP	74	120/70	99	1	4m	N	Y
23	S	KAISMA	23/F	321746	50	PBSC L ELBOW	RELEASE SSG	84	112/80	99	1	4m	N	Y
24	L	RAMAMOORTHY	40/M	325412	62	PTRA R FA	SSG	92	140/90	99	1	4m	N	Y
25	S	RAJA	28/M	322451	64	PTS RT THUMB	EIP TO EPL TRANSFER	80	110/68	99	2	5m 30s	VESSEL INJURY	Y
26	S	VIJAYANIRMALA	35/F	325067	50	PTRA R FA	DEBRIDEMENT	96	134/72	99	1	3m	N	Y
27	L	ARUN	22/M	318293	54	PBSC LT HAND	CONTR RELEASE&ABD FLAP	70	104/76	99	1	3m	N	Y
28	S	ILAYARAJA	27/M	318576	48	PTRA R FA	SSG	84	130/70	99	1	3m 15s	N	Y
29	L	BABU	35/M	314247	56	PTS L RING&LITTLE FINGER	EIP TO EDC TRANSFER	98	130/76	99	1	3m	N	Y
30	L	GANESAN	33/M	324563	60	PTS ZONE 1 FLEXOR	SECONDARY RELEAS&REPAIR	84	120/80	99	1	3m 15s	N	Y
31	L	VELU	20/M	324703	50	CHRONIC MP JT DISLOCATION	OPEN REDUCTION	70	110/72	99	1	3m 30s	N	Y
32	S	REVATHI	26/F	317692	50	PTSC R ELBOW	SCAR EXCISION&GROIN FLAP	82	110/76	99	1	4m	N	Y
33	S	KRISHNAN	40/M	323787	54	PTRA R FA	SSG	90	140/90	99	1	3m 45s	N	Y
34	S	RAJAMANI	20/M	317395	46	PTS WRIST	SEQUESTRECTOMY	74	110/70	99	1	4m	N	Y
35	S	SAKIRABANU	40/F	324188	52	PTS R HAND	SECONDARY RECON, EDC WITH FASCIA	84	138/92	99	1	3m 30s	N	Y
36	S	CHINNAKOUNDAR	20/M	322285	54	PTS L THUMB	MP JT ARTHRODESIS	72	104/74	99	1	3m 15s	N	Y
37	L	MILLER	40/M	324708	60	PTRA L HAND	SSG	82	124/86	99	1	4m	N	N
38	L	ASIBUL	20/M	301672	62	PTS L HAND	LOWER END SCAR EXCISION	80	112/72	99	1	3m 15s	N	Y
39	S	RAJENDRA	20/M	326109	56	PTRA R HAND	DEBRIDEMENT & FLAP COVER	82	110/76	99	1	4m	N	Y
40	L	ANNAPURANI	27/F	320855	44	PBSC L ELBOW	CONTRACTURE RELEASE	92	134/70	99	1	3m 30s	N	Y
41	S	MANIMARAN	38/M	328750	50	PTS R HAND	MP CAPSULOTOMY	80	120/80	99	1	3m 45s	N	Y
42	L	NANDAKUMAR	20/M	312230	60	PTS L INDEX	PL TO FDP INDEX	74	110/70	99	1	3m 45s	N	Y
43	S	SUDHAKAR	20/M	315583	52	PBSC R HAND	RELEASE & FLAP	72	108/80	99	1	3m 45s	N	Y
44	L	SURESH	38/M	327044	56	PTRA R HAND	DEBRIDEMENT	90	140/80	99	1	4m	N	Y
45	S	DIVYA	20/F	325919	48	PTRA R HAND	BILOBED FLAP COVER	80	110/70	99	1	4m	N	Y
46	L	RAJESH	22/M	325854	50	PALMAR AVULSION LT	DEBRIDEMENT & FLAP COVER	78	110/80	99	1	3m 30s	N	Y
47	S	MARIMUTHU	26/M	325895	52	PTS PIP JT	OPEN REDUCTION & K WIRE FIXATION	76	120/90	99	1	3m 45s	N	Y
48	L	KASIMA	23/F	321746	48	PBSC L ELBOW	RELEASE & SSG	76	110/72	99	1	3m 45s	N	Y
49	S	YOGARAJ	24/M	312029	52	PTS MEDIAN NERVE	TAGGING FDP INDEX TO MIDDLE	82	120/70	99	2	5m	VESSEL INJURY	Y
50	L	NAGARAJ	24/M	322338	52	PBSC L HAND	THUMB WEB RELEASE	72	120/70	99	1	3m	N	Y
51	S	ASHOK KUMAR	34/M	325740	60	PTS R MEDIAN NERVE	SECONDARY REPAIR MEDIAN NERVE	82	130/72	99	1	3m	N	Y
52	L	TEJARAM	24/M	317074	64	PTS R HAND	FLEXOR TENOLYSIS	80	110/74	99	1	3m 15s	N	Y
53	S	PARVATHY	24/F	324948	54	TRIGGER THUMB	THUMB TRIGGER RELEASE	72	110/74	99	1	3m 30s	N	Y
54	L	BABU	33/M	326340	52	PTS R WRIST	FCU TO EDL WITH FASCIA LATA GRAFT	90	130/70	99	1	3m 45s	N	Y
55	S	VENKATARAMAN	28/M	324351	56	PTS CUT EDC	SECONDARY REPAIR EDC TO INDEX	82	120/70	99	1	3m 30s	N	Y
56	L	SUDHAKAR REDDY	24/M	314749	52	PTS L WRIST	WRIST ARTHRODESIS	70	110/70	99	1	4m	N	Y
57	S	AKBAR	20/M	320135	60	PT GANGRENE R INDEX	SHORTENING CLOSURE	86	124/76	99	1	4m	N	Y
58	L	MANIKANDAN	25/M	324080	62	PTS L FA	LASSO PROCEDURE	70	110/80	99	1	3m 45s	N	Y
59	S	DEVARAJ	25/M	322605	60	PT HT SCAR FA	EXCISION & PRIMARY CLOSURE	72	120/80	99	1	3m 30s	N	Y
60	L	KALAIARASAN	32/M	322943	58	PTS L FA	ORIF L ULNA	74	110/90	99	1	3m 15s	N	N